Vol. XXIII. December, 1902. No. 6.

MUNICIPAL ENGINEERING

A MONTHLY MAGAZINE

DEVOTED TO THE IMPROVEMENT OF CITIES

PAVING, SEWERAGE, WATERWORKS, STREET LIGHTING, PARKS, STREET CLEANING, GARBAGE DISPOSAL, PUBLIC SANITATION, BRIDGES.

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VOLUME XXIII. DECEMBER, NINETEEN HUNDRED TWO. NUMBER 6.

WHAT ARE PAVING, REPAVING AND REPAIR?

By Charles Carroll Brown, M. Am. Soc. C. E.

Several correspondents have asked for information upon the questions indicated by the title to this article, and a few suggestions are offered toward their answer, with the hope that others will add their experience and opinions to the discussion.

The question as to what constitutes paving seems to have been considered most thoroughly by the courts of Pennsylvania, for the reason that in that state the cost of the original paving of a street may be assessed upon the property benefited, while all subsequent repaving and repair must be paid for by the municipality. There have been several cases of resistance of the first assessment on the ground that the pavement of the street had already been accepted by the city and no further construction or reconstruction could be made at the expense of the abutting property. Decisions have been made in favor of each side of the controversy, but the general principle upon which the decisions have been made is stated in several of the decisions in about the following words:

There is no hard and fast rule on the subject of the kind of paving. It is a question of fact in each case, but the governing consideration is the nature of the municipal action with regard to it. Mere maintenance as a highway and repairs and repavings for the purpose of such maintenance are not sufficient, though substantial and extensive; even the laying of gas pipes along a highway, and the grading, curbing and paving of sidewalks is not, in itself, sufficient evidence of municipal adoption to prevent a subsequent paving at the expense of abutting property. The controlling question is one of municipal intent. The cases of Harrisburg v. Funk, 49 Atl. Rep. 992, reported in MUNICIPAL ENGINEERING, vol. xxi, p. 247; Philadelphia v. Debelar, 23 Atl. Rep. 567, 32 Atl. Rep. 639, may be referred to. Some light may also be obtained from Hurley v. Trenton, N. J., 49 Atl. Rep. 518; and from Dick v. Philadelphia, 47 Atl. Rep. 750. From the last mentioned decision the following is taken:

"A first pavement, therefore, in the legal sense, which exempts the abutting property-owners from liability for any subsequent improvement, may be defined generally as one that is put down originally, or adopted or acquiesced in subsequently, by the municipal authority, for the purpose and with the intent of changing an ordinary road into a street. It may be of macadam or anything else. That is a matter of evidence only. If the purpose and intent be wanting, a mere surfacing of the road, however carefully or expensively done, will not be a paving; but if the intent and purpose are present, or to be fairly inferred, then there is a paving, whatever the material may be. It may perhaps be safely stated as a corollary that, prima facie, macadamizing is not a street paving in Philadelphia, or probably in other large cities, while on the other hand there may be a presumption the other way in smaller cities and towns." Reference is then made to Greensburg v. Laird, 21 Atl. Rep. 96; Harrisburg v. Segelbaum, 24 Atl. Rep. 1070; Bryer v. Reading, 24 Atl. Rep. 1075.

Kentucky is a state having somewhat similar legal provisions. In the case of Louisville v. Tyler, 64 S. W. Rep. 415, cited in MUNICIPAL ENGINEERING, vol. xxi, p. 412, it is stated that, since the liability of the abutting property owners for the cost of a street improvement is the creature of the statute, and the statute does not create such liability in Kentucky cities of the first

class except for original construction, authorized by ordinance, abutting property can not be charged for reconstruction, though the original construction was not by ordinance or at the cost of the abutting owners. The fact that no sidewalk was made does not prevent a subsequent improvement of the street from being a reconstruction, nor is it material that the street was originally improved as a turnpike or macadam road, that being the character of nine-tenths the paving of the city at that time. There is a similar decision in the case of Gleason v. Barnett et al., 61 S. W. Rep. 70, noted in MUNICIPAL ENGINEERING, vol. xx, p. 279, though in this case only 16 feet of the 30-foot roadway was originally macadamized. See also L. & N. Ry. Co. v. Nehan et al., 64 S. W. Rep. 457. The Kentucky Court of Appeals, in the case of Levi et al. v. Coyne, decided that a sidewalk which was regraded, recurbed, furnished with metal gutters and repaved with brick was a reconstruction, not assessable on the property, though some old brick were used in some parts of the work. See MUNICIPAL ENGINEERING, vol. xix, p. 423. The leaning in the Kentucky courts is apparently toward the abutting property owners, though there are some slight traces of the use of the same principle which is at the base of the Pennsylvania decisions. The cheaper quality of acceptable pavements is evidenced by the assumption that macadam is a suitable paving for Louisville.

In cities located in states which do not discriminate so closely as these two between what shall and what shall not be paid for by direct assessment upon the property benefited, the practice is dependent more largely upon local circumstances, and the cost of keeping up streets is paid by the city or by the abutting property or by both as seems best, within the limitations of the state laws or the city charter provisions. What constitutes paving in such cities may not be clearly defined or the definition may depend upon the charter provisions, the state law, the custom of the city, the state of the municipal treasury and the opinions of the taxpayers or the city's legal advisers. The custom as to method of paying for street improvements and consequently, very often the strict definition of the term paving, if formulated, may change from time to time as opinions vary.

The writer discussed this question in MUNICIPAL ENGINEERING, vol. xiii, p. 231, in connection with a contest in Grand Rapids over the meaning of the word pavement. It seems that the street railway company was required to pay its share of pavements, while the property owners paid the entire cost of less permanent improvements. The council committee made a gravel street by placing a layer of cobble-stones on a foundation and covering them with gravel, thus making what might be called a telford street, and claimed that it was simply a gravel street, although they admitted that if the gravel were laid first and the cobblestones on top it would constitute a paved street, while the property owners contended that the improvement should be classed as a pavement. The question seems not to have come to the courts for decision. In the editorial referred to, the loose definitions in the dictionaries are quoted, showing little comprehension of the subject by the lexicographers. The books on engineering are also quoted, showing that the classification by engineers is not perfectly definite, though the indefiniteness is really in the classification of telford only, some calling it pavement, one a "paved bottom road-covering" and others being careful not to include it in lists of pavements.

As to the difference between repaving and repair there are similar variations. The following cases will show what the trend is in the states in which they occurred:

In the case of Farraher v. Keokuk, Iowa, reported in MUNICIPAL ENGINEERING, vol. xix, p. 297, the city engineer took up 134 feet of walk, redug the trench, filled it with 11 cubic yards of new sand, used 2,700 new brick and a few old ones in relaying the walk. The city engineer had authority to repair sidewalks without notice to the property-owner and assess the expense, while for new sidewalks a petition from property-owners or vote of council may be required. The court held that the work done was rebuilding or reconstruction and should have been done only on petition or vote of council, and enjoined the sale of the lot for nonpayment of the special tax levied against it.

In the case of Edward L. Robertson v. Omaha, the removal of worn-out wooden blocks and repavement with brick on the old concrete base was decided to be repaving, for the cost of which a special assessment could be made against the abutting property according to the charter provisions in that city. If it had been held to be ordinary repair, the city would have paid the cost.

The contract had a provision of ten-year

NORTH PROSPECT STREET, GRAND RAPIDS, MICH.
Sheet asphalt, Medina block gutter on heavy grade, concrete gutter on light grade.

guaranty, 75 per cent. of the thickness of the brick to remain on the street at the end of that period. The guaranty was stated in definite terms to be of quality of materials and workmanship and not to cover ordinary repairs, and the 10 per cent. of the contract price retained as surety was held to be properly assessable against the property as a part of the original cost of the pavement.

In Kentucky and Kansas, however, a similar 10 per cent. has been held to be in the nature of payment for repairs, and should therefore be paid by the city, and the collection of this portion of the contract price could not be enforced against the property. See MUNICIPAL ENGINEERING, vol. xvi, p. 48, for the Kentucky case, and page 119 for the Kansas case, Kansas City (Kan.) v. Hanson et al. Another case of similar nature from St. Louis, Mo., is reported on page 192 of the same volume. Many decisions in the lower courts have been reported in the current periodicals, some upholding the guaranty clause and permitting the assessment of the cost of keeping the pavement in repair, and some declaring the assessments invalid in whole or so far as the portion chargeable to such repair is concerned. The wording of the guaranty clause doubtless has much effect upon the decision, the inclusion of ordinary repairs, whether expressly or by implication, leading to a decision against the assessment of this part of the cost against the property, while a carefully worded clause, like that used in Omaha, as noted above, eliminates the ordinary repairs from the guaranty and permits the assessment of the entire contract price against the property. This explanation is not always applicable, however, as may be seen by reference to the Kansas City case named above. What repairs should be included under such guaranties has been discussed by the American Society of Municipal Improvements and reported in volumes 4, 7 and 8 of its proceedings. These reports will be found also in MUNICIPAL ENGINEERING, vol. xiii, p. 370, xix, 187, and xxi, 288.

In Wilson v. Trenton the New Jersey Court of Errors and Appeals decided in favor of the guaranty clause. See MUNICIPAL ENGINEERING, vol. xv, p. 116. Other similar recent decisions are noted elsewhere in this number.

The custom of various cities regarding repair and repaving of original pavements and payment for the same is reported in MUNICIPAL ENGINEERING, vol. xiv, p. 281. Buffalo repaves at expense of property when one-third or more of the pavement requires renewal. In Milwaukee, if the new pavement has a concrete foundation (presumably it was lacking in the previous pavement), the property is assessed for the new pavement after allowance has been made for the cost of the old pavement; otherwise the ward bears the expense of renewal as it does of repair.

In vol. xvii, p. 166, the custom of cities in requiring repairs of permanent pavements under guaranty is reported. Buffalo and Minneapolis repair variations from a straight edge of ⅜-inch, New York of ½-inch. On page 11, of vol. xxiii, is given the system adopted for Mobile, Ala., which separates, as well as is possible by rule, the repair due to ordinary wear from that due to defective materials or workmanship.

The indefiniteness of the line between repaving and repair may be a valuable feature, though it sometimes works injustice. The question in a different form is now under consideration in a large Indiana city. It has been customary in the cities of that state to consider ordinary repairs as being under the city's charge, to be paid for from the city treasury, while the cost of any large improvement affecting an entire section of the street might be assessed upon the abutting property. The question is not so much between the meaning of the terms repaving and repair as upon the advisability of assessing the cost upon the property or paying it from the city treasury. If the permanent pavements are kept constantly in good repair they will last much longer than if they are neglected. They will cost the city more for repair each year and their reconstruction will be delayed for several years. If one administration, from policy or from lack of money, neglects the streets, the property-owners on streets so neglected must pay for a new surface sooner than those more fortunate in having their streets well kept up. A material difference and consequent injustice to one set of taxpayers may very easily occur. The council in the city under consideration is refusing to repave certain streets at the property owner's expense because of alleged neglect of the streets for the past six years, since the guaranties on the first pavements of the city have begun to expire.

CANAL STREET, GRAND RAPIDS, MICH.
Sheet asphalt, concrete gutters, brick between tracks.

HOW TO LAY PORTLAND CEMENT STEPS, CURBS AND SIMILAR STRUCTURES.

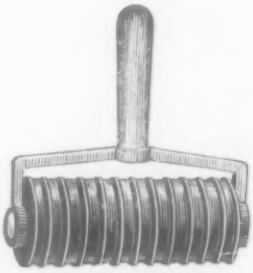
By F. H. Crafts, C. E., Rochester, N. Y.

The lower step is always laid first. A concave frame, seven or eight inches high, is useful in making steps with a convex "rise" or front. The face of the frame is planed smooth and sometimes painted with shellac. The second step laps over the one below.

When ready for the step, concrete is packed in behind the frame, but not against it. Rich mortar one inch in thickness is plastered along the face of the frame, a little at a time, to keep away the concrete, which is tamped all the time it is going in, great care being taken to make a good job. The tread of the step is finished, and as soon as the step is hard enough to stand alone, the frame is removed, and the face of the step finished with a steel trowel. The tread should be fourteen or fifteen inches wide when another step is to be laid above, and it is not necessary to finish a step back of the tread, as this part will be covered by the next step.

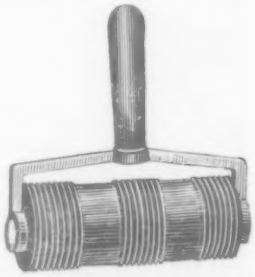
Where curbing is to be laid adjoining a cement walk, some days should be allowed to pass, to let the walk get hard and tough, before putting in the curb. Tar paper should be used to make the separation complete. The outside only of the curb is rich mortar; the interior is composed of concrete, the same as with steps, and mixed one to five. Around stores and railway stations the outer course of flagging sometimes acts as a curb, and is built in the same manner as a step, having a rise of seven or eight inches in front; and, to avoid danger of breaking, diminishing in thickness gradually from front to back. Even this may be broken by an asphalt improvement resting against the walk, instead of going under it. In many places curves can be introduced with the finest effect, as in private grounds, around houses or in parks. Here ash ribbons are useful, in place of scantlings, in laying out the walks.

In order to prevent horses from slipping stable floors and driveways of artificial stone are usually marked across the surface with line or dot rollers.



LINE ROLLER.

It is no benefit to a walk to have mortar plastered on the sides after the scantlings are removed, but at driveways one must either make an approach of concrete and top mortar or set in a stick of timber, or a three-inch plank, against the walk to protect it from carriage wheels.



IMPROVED BRONZE LINE ROLLER.

Concrete head walls give a neat appearance to tile or iron pipe culverts along our improved roads and railways. The end tile is removed when the pit is made for head wall, and concrete two feet deep is laid to bed this tile properly; the tile is replaced and cemented around the junction with the next

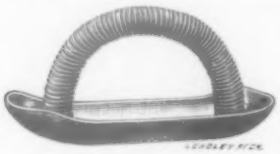
ORDINARY JOINTER.

NORTH DIVISION STREET, GRAND RAPIDS, MICH.
Asphalt block on concrete, concrete gutters.

length. The open box is then set up for the head wall.

The method of manufacture is much the same as for steps. Pieces of concave molding are placed in the vertical corners of the wooden boxes to avoid sharp edges on the finished walls. The box is taken to pieces after allowing twenty-four hours' time for the concrete to harden.

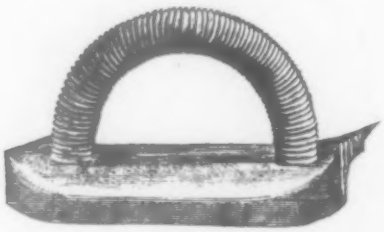
Clean water is dashed over the wall, and a little neat cement mortar is put on the vertical surfaces with a plasterer's trowel, then carefully rubbed down with a wet whitewash brush.



GROOVER.

The job is completed by laying a concrete apron eight inches in thickness in front and around the head wall, both the head wall and apron having the upper surface finished with one inch of fine mortar, like the surface of a sidewalk.

Concrete coping upon stone retaining walls and other structures.—A good effect will be produced by making the blocks about six feet long, eighteen inches high, and having them project about four inches over the face of the stone wall with the vertical joints



IMPROVED EDGER.

very strongly marked. Only every other block (the first, third, seventh, etc.) is laid at first, the others being filled in later, after the first lot has hardened. In this manner, by using tar paper the blocks can be properly separated, and means be employed to mark the vertical joints.

Cement cellar floors.—The thickness of these should be three or four inches, and the concrete should be well tamped, then a thin coating of good mortar spread over the top. No joints are made, but the floor should be higher in the middle than at the sides. Usually a cinder foundation is needed.

The groovers are used on cellar floors for making gutters to lead the water around to the trap.

If one can obtain finely broken stone, such as will pass through a screen with 121 meshes per square foot, it should be used with clean, sharp sand in making concrete.

There should be some pieces of two-inch porous tile under the lowest part of a cement walk to carry water away.

Wooden covers ten feet long are useful to protect new walks from damage. They should be made so that one end will lap over the next cover six inches. Two or three tarpaulins, eight feet wide and twenty or

ORDINARY EDGER.

thirty feet long, made of heavy, old sails are useful to throw over cement which is left over night on the work, when a rainstorm might ruin it. The cement is kept off the ground, raised high on planks with air circulating under it. In case of a sudden shower while one is laying a walk, the tarpaulin is thrown over covers raised high on empty barrels, thus protecting the walk while it is being finished, and keeping the rain away, which a leaky cover would not do. It is well worth while to use these precautions to save a walk from injury, as otherwise one may often lose fifteen or twenty dollars by a single rain storm.

Edgers of several designs are used to round off the edges of walks and head walls, and of still other forms on curbs. There are many designs of jointers to suit the taste of walk makers.

SHELDON STREET, GRAND RAPIDS, MICH.
Asphalt block on gravel, combined curb and gutter.

EQUIPMENT AND OPERATION OF MUNICIPAL ELECTRIC LIGHT PLANTS IN MASSACHUSETTS.*

By Alton D. Adams, Boston, Mass.

Municipal electric plants in Massachusetts began at Danvers, in 1889, with a boiler of 80 and an engine of 60-horse-power, and two dynamos with capacity of 90 arc lamps of 1,200-candle power each. This plant was devoted to the operation of 6 single and 76 double arc lamps for street lighting. Seven other towns had built or purchased electric lighting plants before the middle of 1894, but the records as to their equipments are not complete up to that date. On June 30, 1895, a total of twelve towns had acquired electric plants, and the data as to their equipments are substantially complete from that date. Considering first the apparatus at generating stations, the figures for all municipal plants on June 30 in each year are as follows:

	BOILERS.		ENGINES.	
Year.	No.	H.-P.	No.	H.-P.
1895	18	2190	16	2330
1896	18	2340	18	2930
1897	20	2585	20	3150
1898	23	3280	24	3945
1899	26	3520	27	4235
1900	31	4175	31	4830
1901	32	4375	33	5630

One station has contained two water wheels with a combined capacity of 250 horse-power, from 1895 to 1901.

During the six years from 1895 to 1901 the capacity of boilers has doubled, and that of engines has been multiplied by 2.4. Meantime the average capacity of engines has gone up from 145 to 170 horse-power. These figures indicate that the town plants are sharing to some extent in the general movement to larger generating units.

While engine capacity has gone up to 2.4 times the figure of 1895, dynamo capacities have been multiplied by 3.4. In the year just named the total power of engines was 1.42 times that of dynamos, but in 1901 the engine exceeded the dynamo capacity by only 1.6 per cent. Beginning with 1898 the total dynamo capacity includes a 60 kilowatt generator.

DYNAMOS IN MUNICIPAL PLANTS.

Year.	No. Dynamos.	Kilowatts Arc Dynamos.	Kilowatts Incandescent Dynamos.	Total Kilowatt Capacity.
1895	35	358	865	1,223
1896	42	418	1,117	1,535
1897	49	460	1,349	1,809
1898	63	621	1,817	2,498
1899	71	698	2,156	2,914
1900	72	668	2.528	3,256
1901	75	663	3,433	4,156

This rise of dynamo to substantial equality with engine ratings is in line with a similar movement that has occurred generally in electric stations, and tends toward higher efficiency of operation. The average capacity of dynamos has increased to even a greater extent than was the case with engines.

At the beginning of the period under consideration this average was 35 kilowatts, and in 1901 it had risen to 55 kilowatts. Most notable of the dynamo changes is that of the relation between total capacities of arc and incandescent machines. In 1895 arc dynamos made up 29 per cent. of the total kilowatt capacity, but in 1901 they represented only 16 per cent. of this total. During the period the capacity of arc machines was increased by 85 and that of incandescent dynamos by 239 per cent. Municipal plants included 742 arc lamps in the first and 1,636 of these lamps in the last of the years under consideration, showing a gain of a little more than 100 per cent.

NUMBERS OF ARC LAMPS.

Year.	Single.	Double.	Enclosed.
1895	173	569	....
1896	420	594	....
1897	249	801	....
1898	368	986	....
1899	280	1,113	118
1900	236	1,060	293
1901	228	1,074	334

Single open arcs formed about 23 per cent. of the total number in 1895, but only 14 per cent. in 1901. The use of enclosed arcs began in 1899 and they formed 20 per cent. of the total number in 1901. The adoption of enclosed arcs has not been as rapid as in systems of electrical supply generally.

LAMPS OPERATED BY MUNICIPAL PLANTS.

	Street Lamps.		Commercial Lamps.	
Year.	Arc.	Incandescent.	Arc.	Incandescent.
1895	734	2,535	3	16,889
1896	996	2,436	15	21,985
1897	1,012	2,331	37	31,241
1898	1,199	2,830	123	44,634
1899	1,343	2,938	158	53,103
1900	1,389	3,324	197	62,506
1901	1,413	3,415	215	72,702

The sum of street and commercial arcs in each year was not quite equal to the number of single, double and enclosed arcs because a few of these latter probably remained unused at the stations. In 1895 the greater part of the work of the municipal

*Copyright, 1902, by Alton D. Adams.

CANAL STREET, GRAND RAPIDS, MICH.
Brick block on concrete.

plants seems to have been in the operation of street lamps, as such lamps usually are in use many more hours per day than those devoted to commercial service. In 1901, however, it is not so clear whether street or commercial lamps received the major part of station outputs. Certain it is that the commercial has developed to a much greater extent than the street-lighting side of the business. During the six years under consideration, the number of arc street lamps has about doubled, the incandescent street lamps have increased in numbers 34 per cent., commercial arcs have gone from 3 up to 215, and commercial incandescent lamps from 16,889 to 72,702. Evidently the greatest increase of load during these years has taken place with incandescent lamps.

Municipal plants have done comparatively little in the distribution of electric motive power. Prior to the fiscal year of 1899 no motors were reported as operated by these plants, but in that year the total number was 21; in 1900, 28, and in 1901, 30.

The numbers of poles included by these systems in each year were as follows:

Year.	No. Poles.	Year.	No. Poles.
1895	8,471	1899	13,250
1896	10,144	1900	13,978
1897	10,374	1901	14,424
1898	12,432		

Underground conduits in 1896 measured 2,200 feet, in 1897 1,970 feet, in 1898 1,970 feet, in 1899 2,520 feet, in 1900 2,555 feet, and in 1901 2,555 feet. The smallness of these figures indicates little inclination to put wires underground.

Allowing 3.5 watts per candle power for incandescent lamps and 0.25 watt per nominal candle power for arc lamps, the kilowatt-hours delivered to street lamps by all the municipal plants during the several years were as follows:

KILOWATT HOURS.

Year.	In arcs.	In incandescent.
1892	38,700.7	.....
1893	173,814.5	38,461.2
1894	228,121.6	48,184.2
1895	476,332.3	220,210.5
1896	742,005.2	305,561.6
1897	885,992.5	384,579.9
1898	947,340.6	364,641.3
1899	1,020,450 3	394,763.5
1900	1,081,782.6	478,239.1
1901	1,176,212.5	538,775.1

In 1895 the energy devoted to the operation of incandescent street lamps was a little less than one half of that supplied to arcs, and about the same ratio holds good for the year of 1901. In the later year the kilowatt hours of output to arc and incandescent street lamps alike were somewhat more than twice the corresponding amounts for 1895. Unfortunately it is not possible to give figures showing the energy outputs for commercial service.

The total number of municipal electric plants in the state has grown from one in 1889, to eighteen in 1901. Of these plants two are in cities and sixteen are in towns. Fourteen of the plants include generating stations, and four have only distributing systems and buy energy from private stations.

SOME TYPES OF STREET CONSTRUCTION.

The officials in charge of street improvements in the city of Grand Rapids, Mich., do not confine themselves strictly to fixed standards of construction, but modify them to suit the local conditions of the street, the pocketbooks of the taxpayers and to some extent the desires of the resident property-owners. By the courtesy of Mr. L. W. Anderson, the city engineer, we are enabled to present photographs of several of the types in use.

The sheet asphalt street in the first view, North Prospect, is laid with a Medina block gutter on the heavy grade shown. On lighter grades it has a concrete gutter. The roadway is thirty feet wide. The street in the second view, Canal, was recently repaved with asphalt, with brick between the street car tracks and concrete gutters. But little asphalt paving has been done recently, but the price of $1.43 a square yard for the asphalt portion of this repaving with a ten years' guaranty was considered low enough to cut out competition from other materials.

The third photograph shows an asphalt block pavement on North Division street just laid to replace a cedar block on concrete, roadway, 38 feet. The curb is Medina stone, reset, and a concrete gutter three feet wide was laid on each side. The total cost of this repavement was about $2.64 a square yard, presumably including the resetting of the curb and laying of concrete gutter. The fourth photograph shows Sheldon street asphalt block pavement on gravel foundation with concrete combined curb

GODFREY AVENUE, GRAND RAPIDS, MICH.
Brick, with concrete curb.

and gutter. It was laid in 1900, and the contract price was about $2.47 a square yard including all work. Experience shows that asphalt block should be laid in warm weather that the edges of the blocks may unite under the heat, though chipping on blocks laid late in the season is largely ironed out by traffic the next summer.

The fifth view shows Canal street, laid with brick blocks on concrete at a total cost of about $1.85 a square yard. The sixth view is of Godfrey avenue, 42 feet wide, of brick with concrete curb, costing about $1.83.

The seventh view is of South College avenue, a macadam roadway with brick gutters and concrete curb. The width of roadway is 30 feet. The eighth view shows the 36-foot macadam surface on Turner street with Berea curb and brick gutters 3 feet wide, which was partly reconstructed in 1900.

The ninth view is of a screened gravel pavement on South Fuller street with 30 foot roadway, combined curb and gutter, and an addition to the width of the gutter of 3 feet of brick paving. The 1½-inch surface layer of fine roofing gravel formerly used has been dispensed with, as it cuts up readily in the spring under heavy travel. Fine gravel is used to fill the voids in the medium grade with a sprinkling as a surface finish, thus reducing the amount of binder required. A larger amount of rolling is necessary to form a solid surface.

The city has thoroughly tested the value of steam rollers for extensive repairs of gravel and macadam streets and for rolling of subgrade and at other stages of new construction and now has four rollers, which are shown in the last plate of the series. For part of 1900 five rollers were in use at a total cost for maintenance and operation of $6,411.14. The amount of work was so great that rollers were run much of the time night and day. Under these conditions a roller for full time seems to cost a little over $1,800, of which nearly half is for engineer, less than one-fourth for fuel and somewhat more than one-fourth for repairs and other supplies. In 1901 the day's work was about 11 hours, and the total cost for the four rollers in use was $6,865.75. Operation for full time cost about $1,300 each and maintenance varied from about $200 to $1,300 on the rollers putting in full time, the latter figure including new firebox and rear rolls. There seems to be no question that the roller system is the best for Grand Rapids' conditions, and two new rollers have been acquired within the last three years, one replacing an old one after years of service.

SOUTH COLLEGE AVENUE, GRAND RAPIDS, MICH.
Macadam, concrete curb, brick gutters.

EDITORIAL COMMENT

Corruption in Management of Public Utilities.

Self-Purification of River Waters.

The Ohio Municipal Code.

Corruption in Management of Public Utilities.

The developments in the bribery cases at St. Louis have shown with the greatest clearness that not all the mismanagement, peculation and corruption in municipalities occur under municipal management of public utilities. Indeed, if comparison be made in the city of St. Louis itself, the conclusions must be definitely favorable to municipal ownership and operation.

It is often urged as an insurmountable obstacle to municipal ownership and operation that the requirements of the politicians will lower the grade of service to the detriment of the operation and increase in its cost, and that the opportunities for raiding the treasury, either directly or indirectly, are so great that dishonesty in municipal officials will be the rule.

It is assumed by those who present these arguments that it is not necessary for private corporations to pay attention to the demands of practical politics, and that the lack of direct connection of elected officials with the treasury of the institution is preventive of corruption.

Unfortunately neither of these assumptions is correct. It is seldom that a public service corporation is not in need of some additional favor from the municipal officials, and it is very easy for a city council or for a city officer to make much trouble for a corporation if its privileges can not be directly curtailed. The corporation can quiet the "strikers" or obtain the favors desired, as shown in St. Louis, by finding places for political henchmen, or by the judicious distribution of more direct financial contributions to private or to party treasuries. These transactions can be more thoroughly concealed than similar raids upon public treasuries, and public opinion is not so strongly against them. In fact, therefore, the objectionable features of municipal ownership in this class are simply changed in form and made easier to conceal, and their influence upon the municipal conscience is reduced, while that upon the taxpayers' pockets is increased.

The raids upon the public treasury may be made with equal ease, but they are in the form of high rates for municipal service, or, if a reputation for economy must be cultivated, they take the form of higher rates for private service. Instead of a direct tax for the fattening of the corporation and payment to it from the public treasury, which would be inconceivably corrupt, each user of the service has his taxes increased in the form of excess of its cost over an equitable charge, and bears it almost without a murmur. That much of this extra tax may get into the pockets of the city council and others influencing its legislation is demonstrated by the St. Louis developments, perhaps more clearly than ever before. Thus the corruption argument against municipal ownership is completely riddled.

Another fact which has been demonstrated is that a single venal council may saddle upon a municipality a contract which can not be broken for a long term of years, and the city must pay the penalty long after an awakening of public indignation has "turned the rascals out." A distinct advantage in municipal ownership is found in the fact that when the rascals are turned out they are all turned out, for they are all municipal officials, and the better administration can begin at once, so that the consequences of the malfeasance of a single set of officials are limited very closely to their term of office and the time necessary to perfect a reorganization.

Unless the proposition made by Mr. McMath in this magazine last month is adopted, it is difficult to see what advantage in the line under discussion there can be in private over municipal ownership of public utilities. It will be remembered that he recommends that the odium of a stolen franchise attach to the franchise itself as much as to the officials of city and company who unite in the robbery; that the title to the franchise, whether in the hands of innocent purchasers or not, be subject to the same proof of validity, when questioned, as the title to a piece of real estate.

Some recent decisions by the lower courts

TURNER STREET, GRAND RAPIDS, MICH.
Macadam, Berea curb, brick gutters.

in Indiana indicate a method of escaping some of the consequences of a grant of an unlimited franchise, but unless fraud or misrepresentation on either side is made sufficient to vitiate any agreement or contract between city and company, grants limited in time may be held valid as not being complete alienation of municipal rights.

What is termed municipal control will hardly be better than the present condition as a preventive of corruption, unless the publicity of accounts which is an essential part of that proposition can be forced to serve as a check to shady private transactions.

The water-works of St. Louis are owned and operated by a municipal department without scandal, either of inefficient service of political employes or of raids upon the treasury. If either should develop, the matter is in the hands of the voters, and if the public opinion is in favor of honest administration, it can be obtained at the next election, and without waiting until the expiration of a franchise, with faint hope of bettering conditions even then.

The contract system under departments never turned over to private corporations for operation under franchise shows corruption in some cases and not in others. An argument in favor of construction of public works under municipal officials might be drawn from this were it not that the officials actually controlling the work are the same in either case, and dishonesty and mismanagement would be quite as evident under one system as under the other. Neither can the irregularities in these departments be used as pointing arguments in favor of granting franchises to private corporations.

Self-Purification of River Waters. The United States Geological Survey has begun an investigation of the conditions of the streams of the country regarding pollution, which should result in the collection of a large amount of data to serve as a basis for study of the conditions and of plans for their improvement and for the prevention of further increase in pollution. Mr. M. O. Leighton is in charge of the work, and is at work this winter in Indiana and Illinois. A recent bulletin of the survey discusses briefly some of the data already collected, showing that self-purification takes place most rapidly in still water, and that the conditions in each river must be considered individually in order to form a judgment upon the capacity of the stream for self-purification.

Reference may be made to the reports of the New York State Board of Health for 1890 and subsequent years for data and discussions of them which demonstrated the same proposition. It was there shown for example that in one case the effect of the sewage of a city upon the stream into which it was discharged was still evident to some extent at a distance of eighteen miles, while that of another disappeared within five to seven miles. The only material difference between the two cases was that the stream below the first city flowed through a series of pools and rapids, almost always shallow and fairly rapid, while the sewage from the second city discharged into a pond about three miles long and at the point of discharge nearly twenty feet deep at low water, thus giving a very slow current for some miles and many hours of flow. The cities are Amsterdam and Schenectady, New York, located on a reach of the Mohawk river in which there are very few and small tributaries. One of the same reports shows the effect of sedimentation in the St. Louis settling basins in rapidly diminishing the number of bacteria.

The work upon the Illinois river in determining the manner of disappearance of the Chicago sewage makes the same showing, beginning with the first observations upon the old Illinois and Michigan canal when the construction of the drainage canal was under consideration.

It is scarcely possible as yet to predict the approximate results of chemical and bacteriological analyses of river water at a given point, as regards artificial pollution, from an inspection of the stream above that point and of the sources of pollution, but the data which it should be possible to collect in the course of the present investigation may aid much in reaching this stage, which does not seem far away to those who have had detailed experience in investigations of stream pollution.

This magazine is much interested in the success of the investigation, and suggests that its readers transmit to this office or to Mr. Leighton any information or suggestions or references to sources of information, whether of seeming importance or not, which may come to their knowledge.

The Ohio Municipal Code. The new municipal code of Ohio passed by the Seventy-fifth General Assembly in extraordinary session on October 22, 1902, relieves the situation in that state by establishing forms of government to take the place of those declared unconstitutional by

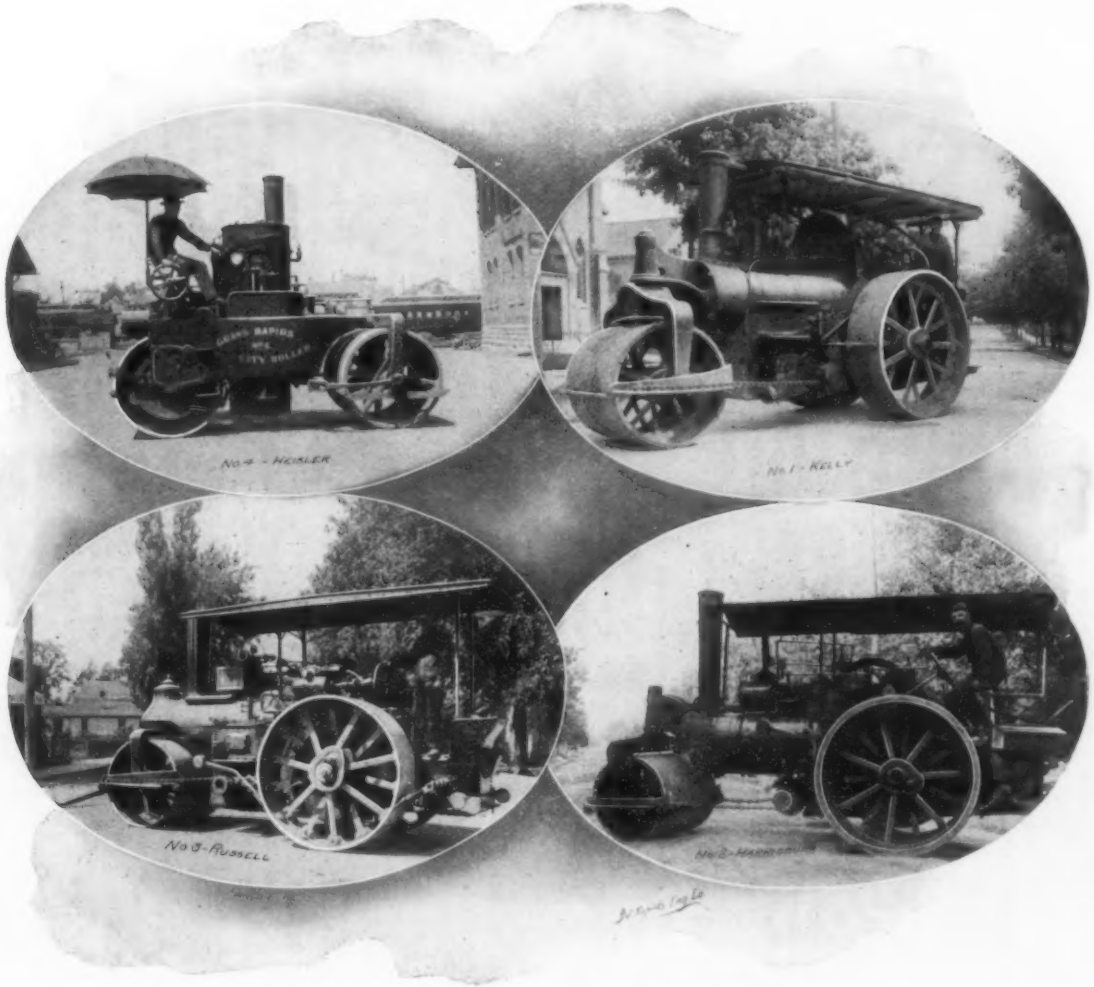
SOUTH FULLER STREET, GRAND RAPIDS, MICH.
Screened gravel, combined curb and gutter with additional brick gutter.

the courts, but is far from attaining the ends desired by the prominent advocates of good government who have been laboring to present their ideas to the legislature. Doubtless those on the ground could give many reasons for the failure of the state legislative and executive powers to take a broad and comprehensive view of the problem, but to the onlooker the demands of practical politics and the fear that individual mayors elected by the opposing political parties might be able to exercise for a time too much power in their limited jurisdictions to suit the local political managers of other parties, seem to have obscured with their small proportions in close proximity the broad field of municipal welfare. The code as adopted seems to be a combination of these limited ideas with an occasional insertion of one which gives a hint of what might be.

A complete copy of the code has been received from F. J. Heer, the state printer. It contains 132 pages of code and 18 pages of a list of section numbers and acts repealed. The first division classifies cities as having more than 5,000 and villages as having less. Villages are to be incorporated according to the previously existing statute. The second division defines the powers of municipalities, including the usual list of general and special powers. Provisions of note are those limiting franchise periods for street railways to 25 years, giving council choice of three methods of assessing cost of improvements, according to tax value, benefits or frontage, and establishment of sinking fund. The third division gives the details of organization. One member of the council in five, minimum number three, is elected by the city at large. The mayor, president of council, auditor, treasurer, solicitor and board of public service are elected by the people, and are apparently made independent of each other, thus distributing the responsibility for the administration of city affairs beyond any hope under ordinary conditions of joint action, or of locating in many cases the sources of extravagance and neglect. The overlapping of duties and the omission of them from the lists in the statutes make it possible for every official to shirk the responsibility for many of them, and make it impossible to force unwilling officials to perform such duties. The board of public safety is appointed by the mayor with the advice and consent of two-thirds of the council, the appointment being transferred to the governor if the two can not agree. It is difficult to conceive a general plan which would be any more objectionable than this, or more likely to keep the department in the ferment of politics, notwithstanding the provision that not more than half the board shall belong to the same political party. No public service industry except the street railway is mentioned in the provisions regulating franchises, an omission which raises a suspicion of more than neglect.

The general principles on which this division of the code seem to be based are that the municipality is a political body, and that each of its officials must be treated as an individual, and aside from the requirements in the code, practically independent of all others. The modern theory of the municipality is that it should be a business institution established to perform for the citizen what, under city conditions, he can not well do himself, and to act as the agent for the individuals and for the citizens as a whole in supplying their needs and ministering to their convenience and comfort. This theory would treat the general management of the concern in the same manner that the management of a large business corporation is treated. Ordinarily, this means the appointment of a responsible head with advisers in the various departments who are at least in part subject to his pleasure as regards term of employment, and are directly responsible to him for the success of their department management. This is a logical position, and with the provisions of civil service tenure among minor employes and of periodical revision of the policy of government through election of the chief, places the responsibility upon him without question and enables him in turn to hold to account any of his subordinates who fail in their performance of duty.

Many of the cities in Ohio have long been under the domination of the less responsible and efficient politicians, under charters similar to the one now adopted, and it is greatly to be regretted that these politicians have been able to force upon all the cities of the state their system of political domination to the exclusion of the opportunity for business administrations.



CITY ROAD ROLLERS OF GRAND RAPIDS, MICH.

THE QUESTION DEPARTMENT

BOOKS ON HIGHWAY CONSTRUCTION.

I shall be glad to know what you consider the best book published on Highway Construction.

C. V. Acton, Port of Spain, Trinidad.

Byrne's "Highway Construction" ($5) is probably the best book for our correspondent's purposes. It treats in detail of macadam roads of various kinds, and also gives considerable attention to the hard pavements of cities. Aitken's "Road Making and Maintenance" is an English book of a similar nature. It gives less space to hard pavements, but carries its discussion of macadam road building even to the operations of quarrying the stone.

Tillson's "Street Pavements and Paving Materials" ($4) is another excellent American book. Its detail is greater on pavements and less on roads than the other two named, and for hard pavements would be put first in order of merit. Judson's "City Roads and Pavements" ($2) is a new book devoted to the street improvement of the smaller cities. It has full descriptions of pavements for their purposes including the better classes of macadam and telford construction, and is excellent authority in its particular line.

PRICES FOR PAVING MATERIALS.

I would like through your columns to inquire for information regarding prices for paving material, especially brick, stone curbing, concrete roadways.

F. L. Knight, C. E., Crown Point, Ind.

Prices for paving materials are largely local matters, depending upon the freight rates upon the materials desired. A few figures from recent lettings will give some idea of the prices prevailing during the past season in the states about the location of our correspondent.

Brick paving in Iowa, including foundation, materials and laying, cost from $1.21 to $1.69 a square yard. The highest prices call for 6-inch concrete base. Stone curbing cost 43 to 50 cents a linear foot, the latter price being for 5x20 inch size. In Michigan, brick paving cost $1.75 a square yard, and brick paving blocks cost $20.30 to $21.20 per thousand. In Ohio, brick paving cost $1 to $1.70 a square yard. In Niles, Ohio, the bids were from $1.55 to $1.65 a square yard for furnishing the materials and 20 to 42 cents a square yard for laying them. Stone curb cost 31 to 45 cents a linear foot according to freight and quality of stone. In Ilinois, brick on concrete cost $1.15 to $1.32. In Minneapolis, bids for furnishing paving brick on cars ranged from 84 cents to $1 a square yard of pavement.

Very little concrete street paving has been laid. The only streets improved in this way recently were illustrated in the November number of MUNICIPAL ENGINEERING. They are at Grand Rapids, Mich., and cost $1.56 to $1.78 a square yard. See pages 335 and 400. Natural hydraulic cement concrete for street paving was quoted in one letting at $4.15 to $4.75 a cubic yard, in place, and Portland cement concrete at $4.95 to $7, according to quality and amount of cement used. Proximity of stone or gravel and quality of concrete required will practically determine the cost of concrete for a given locality.

Indiana prices are not quoted, as the method of bidding makes the determination of unit prices very difficult.

EFFECT OF INCORPORATION ON TITLE TO STREET.

In the incorporation of a borough through which runs a public road, which is adopted by the council of the borough as a street of the same width, and the same is used as a street in said borough, does an abutting property owner still continue to own to the middle of the street the same as he did when it was a public road, subject of course to the public's right of way upon the surface.

R. E. Vandruff, Waynesburg, Pa.

As an abstract proposition this question would be answered in the affirmative, and the procedure in Pennsylvania regarding street improvements, noted in the article elsewhere in this number under the heading, "What are Paving, Repaving and Repair," would indicate that there is no special legislation in that state which would change the principle upon which the affirmative answer is based. An attorney familiar with Pennsylvania statutes could quickly tell whether there are any special legal provisions which would modify the common-law principle involved.

NATIONAL GOOD ROADS ASSOCIATION.

Will you be kind enough to give me the address of the secretary of the National Good Roads Association and the place and date of the next meeting.

Walter A. Osmer, Logansport, Ind.

The officers of the National Good Roads Association are W. H. Moore, Pres.; R. W. Richardson, Sec'y; Edwin A. Potter, Treas.; Martin Dodge, Director Office of Public Road Inquiries, U. S. Dept. of Agriculture, Advisory. The headquarters of the society are at 928-929 Marquette Building, Chicago, Ill. The last convention was held in St. Paul, September 2, 1902. The time and place of the next convention have not yet been announced.

MAKER OF RATTLERS FOR TESTING PAVING BRICK.

Will you please put me in communication with a manufacturer of or dealer in rattlers for testing paving brick?

Howard Egleston, Havana, Cuba.

The standard rattler for testing paving brick, adopted by the National Brick-Makers' Association, is but slightly modified from the ordinary foundry rattler. It is 20 inches long and 28 inches in diameter, inside, with no shaft through its center. The cross-section is a regular polygon of 14 sides, with ¼ inch of clear space between the staves. Heads should be of gray cast iron, not chilled or case-hardened, and staves of steel plates, with no projections on the inside. Other rattlers may be used from 18 to 24 inches long, and from 20 to 30 inches in diameter, the longest being divided into two sections by an iron diaphragm. Reports of tests must show exact differences from the standard. The rattler is to be speeded at 28 to 30 revolutions a minute, and belt power must be sufficient to keep the speed whether full or empty.

Almost any manufacturer of such foundry machinery can furnish a rattler very closely approximating the standard. Names at hand are the Northern Engineering Company, of Detroit, Mich., and the Whiting Foundry Equipment Company, of Harvey, Ill.

STRESSES IN A HIGHWAY BRIDGE TRUSS.

1. I would like your diagram of the stresses in a trapezoidal bridge truss with equal panels, span 45 feet, depth 11¼ feet, load 100 pounds per square foot of floor 14 feet wide, transferred to the panel points by stringers and needle beams.

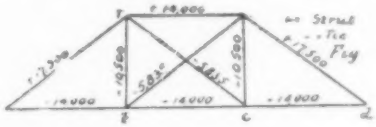
2. Is the rafter *af* a beam or pillar or both, truss used as a bridge? Is the straining beam *ef* strained as a beam or pillar or both? If the truss is used as a bridge are diagonal ties necessary, *eb* and *cf*? If there be no diagonals and no load on *b* what is the effect? What part of the load at *c* goes to *a* and how? If there be diagonals and no load on *b* what part goes to *a* and how?

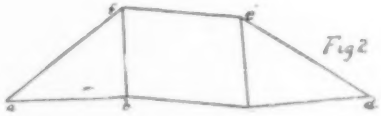
3. I saw a plan for a 40 foot span 8¼ feet high, 14 feet roadway 10 by 12-inch chord, batter post and straining beam, 1-inch diameter rods, without any diagonals. Is the plan faulty?

4. What is a good elementary treatise on bridge trusses? Is there any special work on Pratt, Howe or Warren trusses? Is there a periodical giving special attention to the subject of bridges?

B. S. R., Guthrie, Okla.

1. The following Fig. 1 is a diagram showing the results of a rough computation of the maximum stresses in the members of the truss, assuming the 100 pounds per square foot to include the live load and also the weight of bridge, except for the diagonal rods where it is assumed as the live load only. The stresses in these rods would actually be less, in proportion to the error in this assumption. But one of these rods is in action at a time, *fc* when the





load on *c* is the greater, and *eb* when the load on *b* is the greater.

2. The pieces *af* and *ef* act as pillars or struts if the diagonals are in action, especially if the joints at the lettered points are hinged so that the pieces are free to turn about them. If there are no diagonals the joints must be stiff and the pieces completely restrained from turning about them as pivots or hinges, otherwise the movable weight being at *c* and not at *b* the truss would deform by the weight at *c* pulling down the joints *c* and *e* and consequently thrusting up the joint at *f* in the manner indicated in the sketch, Fig. 2, until something gives way and the bridge breaks down. If *a* and *d* are not fastened to the abutments they can move toward each other and thus permit the deformation of the lower chord and the doubling up and fall of the truss. If, however, the tie *abcd* is built up of timber so as to form a continuous tension piece, it can not bend at the points *b* and *c*, and the bridge will carry a greater load without breaking down.

If the joints at *a*, *f*, *e*, and *d* are built so

that the pieces meeting at these points are firmly fastened and abutted together so that they can not turn until something gives way, the tendency to turn about the joints is counteracted and the force causing this tendency produces bending moments in the pieces *af*, *fe*, and *ed*, that is, they must act as beams. In this case, therefore, they act both as struts or pillars and as beams. The bending action is much greater if the bottom chord, *abcd*, is of iron rods than if it is of timber. If the loading is symmetrical (no excess at *b* or *c* of one over the other), this bending action will not occur and the pieces *af*, *fe*, and *ed* will act only as struts. When a moving load comes on one end of the bridge, the bending action will begin and will change as the load moves until it is symmetrically disposed (if it can be) or until it moves off. The diagonal ties relieve the strain on the joints. They are absolutely essential if the joints are loose, and they are always desirable as aids to maintaining the integrity of the joints and the bridge under sudden shocks from heavy loads, and the expansion and shrinkage in wet and dry weather.

The excess of load at *c* over that at *a* is distributed to the abutments in inverse proportion to its distances from them. In this case, one-third this excess is transmitted to the abutment at *a* for support, this vertical force passing through the pieces *cf* and *fa*. The straining piece *fe* has a horizontal thrust set up in it from its action to keep the point *f* pulling towards *c*, and the strut *af* has a similar horizontal component set up by the same action of *cf* at the point *f*. If there are no diagonals and the bottom chord is of rods, the force (one-third the weight at *c*) passes to *a* through the pieces *ce*, *cf* and *fa*, and the action of the tie *cf* in the former case is replaced by the action of the stiff joints, and the force produces a bending strain in the pieces *ed*, *cf* and *af* in addition to the direct thrust which they would have with the diagonal in action. If the bottom chord is of timber, part of the load will be carried on it as a beam, thus subjecting it to bending stress as well as its proper tensile stress, and reducing the stress on the joints of the upper chord. The assumption throughout is that all parts are in perfect adjustment. If they are not, the stresses may be quite differently distributed.

3. If the rods are single they are too small. The sufficiency of the remainder of the bridge depends on the integrity of the joints. If they are stiff and strong and certain to remain so, the diagonals will not be missed. If they become loose or the timbers rot at their ends, the effect will be felt sooner than if the diagonals were present. They will need frequent attention to insure their remaining tight. The material and design of the bottom chord will also have an effect upon the durability and stiffness of the bridge.

4. Boller's "Practical Treatise on the Construction of Iron Highway Bridges" ($2), though old, is an excellent book, written for the use of town committees and giving a good statement of the principles of good bridge design. Waddell's "Designing of Ordinary Iron Highway Bridges" ($4) is a modern book written for the engineer and is one of the best books on the subject. Johnson, Bryan and Turneaure's "Theory and Practice in the Designing of Modern Framed Structures" ($10) is the most complete book, giving methods of analysis and design and details of construction of wooden, iron and steel bridges. Cooper's "Specifications for Steel Highway Bridges" (50 cents) and Thacher's and Osborn's "Specifications for Highway Bridges" (each 25 cents), give statements of the most modern requirements in bridge construction. The first named book considers the types of trusses mentioned, the others consider them among the many types of trusses. The writer knows of no periodical devoted exclusively to bridges. All the engineering periodicals which cover fields in which bridges are used devote some space to those types and methods of construction of most interest to their readers, but seldom go into the rudiments of bridge design and computation, leaving these subjects to the many good text books upon all phases of bridge work.

CONCRETE BEST FOR CURBS AND BRIDGES.

The city council in deciding between Northern Ohio sandstone, native white limestone and artificial stone for curbing decided on my advice in favor of the latter, which is 4 cents a foot cheaper than our limestone. The best limestone we have cracks and disintegrates when set on edge. But the journeyman stone masons of Kansas City have passed resolutions objecting to the plans of the city engineer for a concrete bridge saying that they "know by test and experience that stone is far superior to any known composition." I made my decision from reading in your magazine about bridges, culverts, etc., of concrete in certain eastern cities and towns. What do you think?

J. A. Wilson, Lexington, Mo.

If the cement curb is properly made with the best materials, you have undoubtedly

made the best choice, especially if compared with limestone. All limestone used for curb is subject to greater or less disintegration by the weather, even if hard enough to stand the wear to which it is subject in the curb. Nearly all limestone is stratified in layers thin enough so that when set on edge in a curb there are several lines where there is liability of absorption of water enough to give trouble from freezing, and where disintegration from ordinary weathering is most likely to begin. Perhaps the only exception is Bedford stone, and the layers sold for curb are usually the thinner layers in the quarry, those not suitable for building stone on account of lack of depth. Sandstone stands the weather much better if of good quality, but disintegrates even more rapidly if of poor quality. Thorough inspection of materials and workmanship of cement curb and a guaranty for a period of years, say three, should insure good work, just as close inspection is necessary to secure good limestone or sandstone curb and proper setting. Cement curb should have a neater appearance than either of the kinds of stone named. The saving in cost for a better curb is notable in this case, and the saving over the Ohio curb, probably of equal durability and less satisfactory appearance, would be still greater and would usually decide the matter if it were not already settled.

With reference to the opinion expressed by the Kansas City stone masons it may be said that there are some classes of stone which are superior in some respects in some situations to any known composition. But when adaptability to the conditions, cost, rapidity of construction, durability and appearance are all considered, the decision is very frequently in favor of concrete. Doubtless a granite bridge would be more durable, if not subject to the action of fire, and its appearance would be considered more pleasing, but when the difference in cost is considered, unless appearance is a very important factor, the argument for concrete is very weighty, for that material is unquestionably durable and sufficiently strong for structures of this sort. There a few other varieties of stone which are preferable on the score of appearance and are almost equally durable, and if time taken in construction and some difference in cost are not important they may be used, but many limestones and sandstones are much less durable than good Portland cement concrete and it costs more to put them into a bridge, so that for nearly all ordinary work, both durability and cost are in favor of concrete, and ease of construction, time occupied and lasting good appearance are additional advantages for the concrete material.

STRENGTH OF REINFORCED CONCRETE.

Can you refer me to any book giving the use of expanded metal in connection with concrete? I would like to get definite figures.

Geo. Story, C. E., San Luis Obispo, Cal.

The development of the use of reinforced concrete in this country began so recently that nothing in aid of definite computations has yet appeared in the textbooks. In fact, there are but few articles in the engineering periodicals giving data regarding strength and methods of computation. In European countries, where the use of steel reinforcement was begun some years ago, the study of the combination has been more detailed, and there are German and French books and articles in technical publications in various languages giving results of tests and computations. A few articles in American Society proceedings give some information. The following are at hand at this time: American Society of Mechanical Engineers, May, 1902, on concrete-steel coal pockets; American Society of Civil Engineers transactions, Dec., 1901; Indiana Engineering Society proceedings, 1901 and 1902, on concrete-steel beams; Journal of Western Society of Engineers, June and October, 1900, on Monier construction; Journal of the Association of Engineering Societies, Feb., 1901; Proceedings of the Engineers' Club of Philadelphia, July, 1901, on expanded metal. There are also some articles in the current engineering weeklies and monthlies giving results of tests of floors, beams and other structures, mostly made for commercial reasons, and giving descriptions of construction of various concrete steel structures and of their action in case of fire or accident. The circulars and handbooks of the various companies controlling the patents under which nearly all concrete-steel constructions are made give many data of tests and methods of construction which it should be safe to accept, since the managers certainly desire their structures successfully to perform the duties required of them.

MUNICIPAL ENGINEERING MAGAZINE has several articles on concrete-steel construction as applied to arches and bridges, using heavier steel members than are used in the expanded metal, and Monier, Hennebique

and other systems for architectural construction. Other articles on the application of these systems to engineering structures will follow from time to time. The systems are now in the stage when theory is being applied to the study of their action in this country, as it has been in others, and the number of tests is rapidly increasing so that information sufficient to form a basis for the theoretical analyses is to be expected soon, and the design of structures will then be somewhat nearer to uniformity than it is at present.

CEMENT PIPE AND CONCRETE SEWERS.

Can you give us the addresses of firms who manufacture cement pipe, or some information regarding the construction of a sewer of cement or concrete, the sewer to be 5 feet in diameter, oval or circular.

Fred B. Suppiger, Highland, Ill.

Many contractors now make cement sewer pipe and cement or concrete sewers. Their names may be found in the "Directory of American Cement Industries and Handbook for Cement Users" (85). Reference to the advertisements of the firms listed in the business directory in our advertising columns under the heading "Cement Construction" will give the names of makers of apparatus for the manufacture of cement pipe, and to the list under the headings "Contractors" and "Concrete Work" will give the names of contractors who can make and lay cement sewer pipe and build concrete sewers.

The "Directory of American Cement Industries" describes the methods of concrete sewer construction used at Coldwater, Mich., and at Washington, D. C., giving specifications for the latter. It also gives the formula and brief statement of process for making cement pipe.

In MUNICIPAL ENGINEERING MAGAZINE will be found several articles upon the use of cement pipe and concrete for sewers. In vol. xxii, page 325, will be found a description of a method of constructing a concrete sewer invert, and on page 169 an article describing the construction of the Coldwater, Mich., concrete sewer with monolithic concrete invert and concrete block arch. On page 168 the use of reinforced concrete in an inverted siphon is discussed, and in vol. xv, page 257, are given some tests of concrete and reinforced concrete sewers. In vol. xxii, pages 19 and 20, will be found the names of a number of cities using concrete sewers. The use of reinforced concrete for large sewers, especially if they are not circular in cross-section, is rapidly extending. Cleveland, Ohio, and Indianapolis, Ind., now have such sewers under construction under specifications prepared by their respective city engineers.

MAKERS OF CEMENT CURB AND GUTTER MOLD.

Please send us the address of makers of cement curb and gutter molds.

F. T. Justice & Co., Lexington, Ky.

Cement curb and gutter molds are usually built in place by the constructor. Clamps are convenient metal accessories, the remainder of the mold being of wood, possibly with sheet metal next the smooth surfaces, though they are better formed by proper working with hand tools before the cement has completely set. The concrete is usually made with as little water as possible and is thoroughly tamped in place so that the mold boards can be removed almost as soon as the concrete is in place, thus giving the opportunity for forming the surfaces. The firms named in the business directory in the advertising pages under the heading of "Cement Tools" probably can furnish the clamps and any other special tools desired.

BRICK FROM SAND AND CEMENT.

Are there any patents on the process of making building brick from sand and cement, and do you know of buildings constructed of cement brick? Where are such brick manufactured?

G. F. Roess, City Engineer, Oil City, Pa.

There are patents on brick made of cement and sand with and without pressure, and with and without special chemical additions, as well as on silica brick made without cement under pressure and steam heat. The names of certain owners of patents and makers of brick will be found in answers to this question in earlier numbers of MUNICIPAL ENGINEERING, vol. xxiii, page 180; vol. xxii, pages 89 and 92; vol. xxi, page 404. The manufacture of the brick is being extended to various cities, the latest reported to this office being Des Moines, Iowa, by a company promoted by M. B. Frost and E. Hornbeck, of Kansas City, Mo. Each of the cities represented in the lists of names referred to has buildings made of the brick, and there are doubtless many others. The persons named will give references to such buildings and to manufacturers of the brick located elsewhere. It is doubtless possible to make cement brick without infringing on any of the existing patents.

RELATIVE MERITS OF WET AND DRY CONCRETE.

We are anxious to find some articles by experts discussing the relative merits of wet and dry concrete for building purposes. Will you kindly let us know where such articles have appeared in the last year or two?

The Ferro-Concrete Construction Co., Cincinnati, Ohio.

Which is considered to be the best way of placing concrete, by mixing thoroughly with as little water as will dampen and thoroughly ramming it in place or in slush form so that it will run to place?

A. L. P., Sparta, Wis.

The use to be made of the concrete and the form and future treatment of molds sometimes decide the question of amount of water to be used. For curb, artificial stone blocks, sidewalk, walls and other structures which must be ready to bear their own weight and keep their form as promptly as possible, the dry concrete is essential, but where close texture of block, perfect filling of mold and uniformity of surface are required, and more time can be given for the final setting, wetter concrete is often preferable. In masses, and for such structures as street foundations, it has heretofore been considered that dry concrete was preferable, but some recent experiments and results of observation have somewhat modified the opinions upon this subject, and the preference now seems to be for wet concrete. But by this is not meant concrete wet enough to run to place, a slight quaking under the rammer being the usual limit set to the amount of water to be used. This corresponds to the usual product obtainable under what may be termed a dry concrete specification. The tendency of the concrete mixer is to use a maximum of water, especially if the mixing is done by hand, because the work is apparently done so much more rapidly. The excess of water acts detrimentally in two ways, by giving the appearance of thorough mixing, which is not secured, and by washing out the cement and thus preventing its complete action as well as making its distribution irregular.

The meaning of the terms wet and dry concrete must not be misunderstood. In the experiments whose results are reported in the articles to which reference is made below, dry concrete is concrete which under heavy ramming does not flush water to the surface, or if so only in very slight amount, while wet concrete will not flow to place, but under a reasonable amount of ramming will quake and flush water to the surface. When cement mortar is used with very finely broken stone or fine gravel, the mortar or concrete may be made wet enough to flow to place without ramming, if this mixture is thoroughly made and separation of the ingredients is carefully prevented. It is easy to get too much water for good work of this kind, which is not, strictly speaking, covered by the question.

The conclusion apparently is that wet concrete, i. e., concrete quaking somewhat (but not too much) under the rammer, is better than dry concrete in which it is difficult to flush water to the surface by ramming.

The following articles may be referred to, giving results of experiment and observation, and the consequent judgments of engineers with experience:

MUNICIPAL ENGINEERING MAGAZINE, vol. x, pp. 188 and 255; vol. xviii, pp. 30 and 268, in which dry mixture is defined as one which requires a repeated ramming to bring water to the surface and wet mixture as one which quakes when slightly rammed; the questions asked in this article were answered and the answers reported in an article by W. A. Rogers before the Association of Railway Superintendents of Bridges and Buildings, copy of which can probably be obtained of him at Chicago; vol. xxi, p. 112; vol. xxii, p. 237; vol. xxiii, p. 92; Journal of the Western Society of Engineers, December, 1900, and June, 1902; Illinois Society of Engineers and Surveyors, 1902; Indiana Engineering Society, 1902.

HARDENING CEMENT SURFACES.

Could you tell us the best method of hardening the surfaces of cement blocks or stones cast in molds?

What is the best book on cement and its uses, giving practical help in mixing, coloring, hardening, etc.?

The Hugill Stone and Supply Co., Akron, Ohio.

If the mortar is permitted to retain its water until the cement has set the surface will become hard without the use of anything else. A porous mold, such as unsaturated wood, will absorb the water from the mortar which is needed in the process of setting and so far as its effect extends will prevent the hardening of the stone. Waterproofed wood, or better, metal molds or metal lining, are more satisfactory because non-absorptive. If it is desired to remove the molds quickly a mixture with the least amount of water possible, thoroughly tamped, will keep its shape if the sides of the mold are removed at once, but the block can not be safely removed from the base of the mold until it has thoroughly set. The

blocks should be lightly sprinkled from time to time to replace water lost by evaporation if the best results as to hardness of surface are desired.

If what is wanted is the hastening of the hardening of the cement, several chemicals can be used, such as the carbonates of sodium and of potassium, for quick action, sulphide of calcium or carbonic acid in the water for slower action, and plaster of paris. These have various efforts upon the durability of the stone and are not recommended for exposed or high class work. Several secret processes for hastening the hardening of cement are on the market which are presumably of similar composition and are of doubtful utility especially in exposed work.

The "Directory of American Cement Industries and Handbook for Cement Users" (85) is the best book covering the points named as well as the entire cement field. Next to this are the numbers of MUNICIPAL ENGINEERING MAGAZINE which contain full reports of the advances in the applications of cement in construction.

WHITE PORTLAND CEMENT.

Can you inform us of any one manufacturing a white Portland cement? Would such a cement have a value above the ordinary Portland cement?

Eddy Bros., El Paso, Texas.

No one in the United States at present manufactures a white Portland cement. As stated in the "Directory of American Cement Industries and Handbook for Cement Users," the Art Portland Cement Company, of Sandusky, Ohio, was formed to manufacture white Portland cement but later went into the manufacture of standard Portland and is now reported to be out of business entirely. The New England Portland Cement Company expected to make a white cement, but the kilns it proposed to use are reported to have failed and the works are now used for other purposes. One or two persons have suggested their desire to enter this field of manufacture but have not yet announced any progress.

There are several uses to which a white Portland cement could be put, including pointing and mortar for fine stone work, art work of various kinds, in statuary, building decoration, etc., where plaster and the ordinary non-staining cements are not entirely satisfactory. A good article without any bad qualities should have a good sale at good prices. The field of its use is limited, but the cements with which it would compete cost four or five times as much as ordinary Portland cement, and it could be used in many places where plaster or even the non-staining puzzolans or patent plasters can not be used.

The non-staining cements listed in the "Directory" are all nearly or quite white, but they are not Portland cements, being either of the nature of Keene's cement or puzzolan. Some other brands are claimed to be non-staining but they are not white.

CEMENT MANUFACTURING COMPANIES ON THE PACIFIC COAST.

I am desirous of knowing what is going on in California and the Pacific coast in the line of the manufacture of Portland cement. I would like to know how many plants are in operation, the number in course of construction and the companies formed that propose to build for that trade, their location, capital, size of plants, etc.

J. A. Bowden, Detroit, Mich.

The "Directory of American Cement Industries and Handbook for Cement Users" (85), the second edition of which was issued June 1, 1902, gives the latest information in reply to this question. From that book the following names of companies are taken. For details reference should be made to the book itself:

California Cement and Lime Company, San Joaquin county; office 328 Montgomery street, San Francisco, Cal.; works not yet constructed.

California Portland Cement Company, Colton, Cal.; office at 104 S. Broadway, Los Angeles, Cal.; has been in successful operation for several years.

Eureka Portland Cement Company, sold to the Pacific Portland Cement Company of San Francisco, below.

Great Western Cement Company, incorporated to build works for making natural hydraulic cement near Redlands, Cal.; office 64 Federal st., Boston, Mass.; E. B. Crane, Pres.; construction not yet begun.

Pacific Cement Works Company, incorporation reported, probably to operate near Victoria, B. C., but nothing further yet ready for publication.

Pacific Coast Portland Cement Company, incorporated to build works at Vancouver, B. C.; office at 66 Broadway, New York; not yet ready for active work.

Pacific Portland Cement Company of San Francisco, Cal.; works in active construction near Suisun, Cal.; will soon be ready for operation; office in Claus Spreckels Building, San Francisco.

Pacific Portland Cement Company of Washington, works for making Portland and natural hydraulic cements in active construction at Portland on Pend d'Oreille river

above Newport, Wash.; will soon be ready to furnish cement; office at 326 Rookery building, Spokane, Wash.

Standard Portland Cement Company, of San Francisco, Cal., is reported to have been incorporated to build a plant near Napa, Cal. A later report that an 8-kiln plant is under construction has not yet been verified.

United States Cement Company, rumored as incorporated at Colville, Wash.

Usona Portland Cement Company, rumored as incorporated at Benicia, Cal.

BOOKS ON STONE MASONRY, BRICKLAYING, PLASTERING AND CEMENT USING.

In what books can I find formulæ for making prepared wall plaster? Please give me a price-list of books on stone masonry, bricklaying, plastering and cement using. *Thos. H. Nie, Lyndonville, N. Y.*

The development of the plaster industry in this country has been so recent and so rapid that the methods of preparation have not been detailed in the text-books. The "Directory of American Cement Industries and Handbook for Cement Users" ($5) has a chapter on lime and plaster which gives general directions and methods of manufacture and use of prepared plasters. It also gives formulæ for the use of Portland cement in wall plaster. The prepared wall plasters on the market are all proprietary and their formulæ are not disclosed. The manufacturers of plaster of paris and cement plaster supply formulas for the best use of their materials.

The "Directory of American Cement Industries" is the most practical book on the use of cement. Other books on brick and stone masonry and plastering are Kidder's "Building Construction and Superintendence," Part I, Mason's Work, ($4); Baker's "Treatise on Masonry Construction" ($5); Hammond's "Bricklaying" (60 cents); Maginnis's "Bricklaying" ($2), probably the best book on the subject; Richards's "Bricklaying and Brickcutting" ($1.25), an English book; Burnell's "Limes, Cements, Mortars, Etc." (60 cents), English; Kemp's "The Practical Plasterer" (80 cents), also English.

INDEBTEDNESS AND EXPENSES OF NEW YORK CITY.

Will you kindly inform me of the total indebtedness of New York city, and the total expenses of its municipal government as compared with the total expenses of the federal government? *G. R. Ellis, Canandaigua, N. Y.*

The September "Bulletin of the Department of Labor" contains the statistics of cities for the past year. It gives the following regarding New York city:

Bonded debt	$426,174,823
Floating debt	6,306,472
Total debt	432,481,295
Sinking fund	121,340,920
Net debt	311,140,375

The debt limit of the city is 10 per cent. of its assessed valuation of $3,787,970,873, the water debt not being included in the limitation.

The totals of expenditures, detailed tables of which are given, show the following:

Expenditures for construction and other capital outlay, other than loans repaid	*$53,451,000
Loans repaid	85,034,632
Total	*$138,485,632
Expenditures for maintenance and operation	102,946,573
Total excluding loans repaid	*156,397,573
Total including loans repaid	*241,432,205
Total receipts, including $1,285,821 received from state for schools and $4,863,459 cash in sinking fund	249,184,086
Cash on hand at end of fiscal year	7,751,881

* These include $6,959,037 state tax paid.

In the September "Monthly Summary of Commerce and Finance of the United States," prepared by the Bureau of Statistics of the Treasury Department, it is stated that the total expenditures of the United States for the fiscal year ending June 30, 1902, were $471,190,857.64, including civil and miscellaneous, war, navy, Indians, pensions and interest.

The expenses for maintenance and operation in the city of New York include police, police courts, jails, workhouses, reformatories, etc., fire department, health department, hospitals, asylums, almshouses and other charities, schools, libraries, art galleries, museums, parks, sewers, municipal lighting, street cleaning, street sprinkling and other street expenditures, garbage removal, interest on debt, water-works, docks and wharves, ferries and bridges, markets, cemeteries, bathhouses, bathing pools and beaches and miscellaneous items, but do not include new construction, state tax, loans repaid or sinking fund. This item is probably the one with which the ordinary expenses of the United States as stated should be compared, though the expenditures in the two governments are for quite different purposes. Neither includes new construction and the separation of items into the two classes of maintenance and construction is not as thoroughly made in the national accounts as in the municipal accounts. On the face of the returns the ordinary expenditures of the U. S. govern-

ment are 4.6 times those of New York city, but it is probable that a rigid inclusion of all similar items in both accounts would somewhat increase the difference between them.

INFORMATION ON GARBAGE COLLECTION AND DISPOSAL — VEHICLE TAX — ELECTRICAL AND WATER RATES — PAID FIRE DEPARTMENT.

1. I would thank you to send me a list of the various books and references pertaining to the collection and disposal of garbage in small cities.

2. Where can I obtain some information on the subject of vehicle tax, particularly in cities of 8,000 to 10,000, and the opinion regarding its desirability for cities of that size.

3. Do you know of any reference books which give general reports on the smaller cities covering electrical and water rates?

4. We have three volunteer hose companies and one chemical engine company. Laying out a paid service for a city of this size is somewhat difficult on account of the limited funds available for such service, and also from the fact that the expense would seem to run up into money quite rapidly. If you know of any cities that have accomplished anything along this line where we could get some information I would appreciate very much your putting me in touch with them or with parties who are familiar with this subject.

M. W. Mix, Mayor, Mishawaka, Ind.

1. Chapin's "Municipal Sanitation in the United States" devotes 100 pages to refuse disposal and is the only American book treating the subject. Goodrich's "Disposal of Town's Refuse" ($3.50) is an English book which gives a full report of English practice but does not treat of garbage collection. The back numbers of MUNICIPAL ENGINEERING are the best source of information on this subject. An article on garbage collection and disposal in La-Fayette, Ind., will be found on page 329, June, 1901, in which is given the ordinance controlling garbage collection. A similar article on garbage disposal in Ft. Wayne will be found on page 331, November, 1900. Lists of articles on garbage collection and disposal which have appeared in the magazine will be found on page 386, June, 1899, page 152, September, 1901, and page 302, May, 1902. The methods of collecting and disposing of garbage in the various cities in the United States are given on page 395, June, 1902, part from a report of A. Rosewater and part from the "Municipal Year Book" ($3). The latter book states in a word or two for each city of over 3,000 population whether garbage is collected or not and the method of disposal.

2. Reference may be made to the article on "Regulation of Automobiles," on page 258 of MUNICIPAL ENGINEERING for October, 1902, for some information on vehicle tax. Can our readers send us some information about vehicle tax or license in the smaller cities? The large cities, most of them, have such taxes or licenses, some as a matter of police regulation simply and not covering the ordinary private vehicle drawn by horse and not for hire, while others raise a fund by the vehicle licenses which can be used in the repair, cleaning or sprinkling of streets. Information regarding the smaller cities is not at hand and will be thankfully received.

3. The "Manual of American Water-Works" ($3) gives tables of the principal charges for water in many of the cities of the United States. Brown's "Directory of American Gas Companies" ($5) gives the rates for electric lights charged by all gas companies which also furnish electric light. The reports of the Massachusetts Board of Gas and Electric Light Commissioners give much valuable information regarding cost and charges for electric light under various conditions. In MUNICIPAL ENGINEERING there are many articles upon these subjects. With regard to water rates reference may be made to articles on the following pages: Vol. xxiii, p. 102, giving references to many articles on water meters and rates; xxiii, 24 and 35; xx, 346; xvii, 168, 264; xvi, 384; xiii, 132, comparing the rates of many cities; xii, 96 and 386. With regard to electric lighting rates, reference may be made to xxiii, pp. 160 and 168, showing the average rates in Massachusetts towns, and page 175, giving references to a number of other articles on the subject; also to xxii, 331; xvii, 65, 185. Some of these give information regarding prices charged in cities named, some regarding average prices, some regarding cost, and some give discussions of the principles upon which the fixing of lighting rates should be based. A form of contract for electric service is given in vol. xxiii, p. 20.

4. A table of statistics of fire departments is given in vol. xxiii, p. 260, from which valuable information can be obtained. Cities of about the size named having paid departments, as shown in the table, are Ft. Scott, Kan., Pittsburg, Kan., in part, and Webb City, Mo., in part. The table gives some data as to cost of paid and volunteer systems.

From the Municipal Year Book, referred to above, it is learned that of 43 cities between 10,000 and 11,000 population, 30 have paid fire departments, or 70 per cent. of the whole number; of these 6 are reported as

paying a part of the men only. Of 55 cities between 9,000 and 10,000 population, 36 have paid departments, or 65 per cent.; of these 7 pay a part of the men or pay them for but part of their time. Of 49 cities between 8,000 and 9,000 population, 34 have paid departments, or 70 per cent.; of these 6 pay a part of the men. Of 87 cities between 7,000 and 8,000 population, 52 have paid departments, or 60 per cent.; of these 18 pay part of the men or pay them for part of their time, three or four reporting but one or two men on the paid list.

Of 108 cities between 6,000 and 7,000 population, 63 have paid departments, or 58 per cent.; of these 18 pay part of the force or for part time, 4 paying for attendance at fires only. Of 166 cities between 5,000 and 6,000 population, 73 have paid departments, or 44 per cent.; of these 20 pay part of the force or for part time, 5 paying but one or two men and 3 paying call men for attendance at fires.

The cities in these lists between 5,000 and 11,000 population in Indiana and the adjoining states are as follows:

Indiana — Jeffersonville, Kokomo, Vincennes, Huntington, Wabash, Washington, Peru, Columbus, Brazil, Alexandria, Shelbyville, Frankfort, Connersville, Crawfordsville, Bloomington, Valparaiso, Bedford, Princeton, Hartford City, Mt. Vernon, Greensburg.

Ohio—Tiffin, Middletown, Lancaster, Alliance, Xenia, Warren, Fremont, Wellston, Delaware, Defiance, Niles, Galion, Norwalk, Circleville, Kenton, Urbana, Bellefontaine, Mt. Vernon, Bucyrus, Norwood, Van Wert, Wooster, Troy, Sidney, Glenville, Greenville, Gallipolis, Canal Dover, St. Marys.

Illinois — Ottawa, Mattoon, Waukegan, Pekin, Dixon, Monmouth, Belvidere, Centralia, Spring Valley, Paris, Urbana, Charleston, Harvey, Macomb, Mt. Vernon.

Michigan — Pontiac, Ironwood, Adrian, Escanaba, Traverse City, Iron Mountain, Owosso, Holland, Ypsilanti, Ludington, Benton Harbor, Coldwater, Laurium, Ionia, Wyandotte, Monroe.

Kentucky—Henderson, Frankfort, Bowling Green, Hopkinsville, Maysville, Bellevue, Winchester.

Of these the following pay part of the force only: Pontiac, Mich., Adrian, Mich., Defiance, Ohio, Winchester, Ky., Hartford City, Ind., one man; Urbana, Ill., Charleston, Ill., Macomb, Ill., marshal only. Niles, Ohio, pays the men for part of their time. Centralia, Ill., Spring Valley, Ill., and Canal Dover, Ohio, pay for each call to attend fire.

The authorities in these cities would doubtless respond to requests for detailed information, made by a municipal official.

VENTILATION OF LONG SEWER.

What is the latest and safest way of ventilating a long sewer line? *Jas. Dees, Lumberton, N. C.*

Where manhole tops are not located in unpaved streets or roads, the most satisfactory method of ventilating sewers in American practice is by means of perforated manhole covers. American practice demands sufficient fall in the sewer and without irregularities causing pools of sewage in sunken sections of sewer or behind dams of deposited solids, so that the decomposition of the sewage while in the system shall be a minimum. Under such conditions the perforations in the manhole covers are sufficient, unless the manholes are farther apart than they should be for other considerations. In some instances it has been necessary to put in a few lines so flat that deposits are inevitable. In these cases it is cheapest to clean out such flat sewer lines at frequent intervals. Modern sewers need no other treatment or ventilation than this.

In a few cases of old sewers of defective design and construction, other treatment has been deemed better than reconstruction. At least one city has followed an English practice of running a pipe from each house connection on the outside of the house to the roof, with no trap between it and the sewer. The soil pipe is also run above the roof. The outside pipe thus ventilates the sewer, and the pipe inside the house, trapped from the sewer, ventilates itself. In some cases there is an outdoor inlet to the house system near the ground surface, or inside the house trap. This system is expensive but is good and may be adopted if the clean sewer plan is impossible from defective design and construction of the sewer system and excessive cost of reconstruction.

In one system on the separate plan, designed by a water-works engineer, the upper ends of all sewer lines are joined, thus giving a continuous system of pipes similar to a water pipe system without dead ends. It is claimed that with perforated manhole and lamphole covers this makes a better circulation of air in the pipes and keeps them sweeter. The same plan is in use in England also.

Besides the two above named, the English use connections with factory chimney stacks

and iron vent shafts at the head of sewers, against buildings and in vacant spaces. These shafts are often substituted for perforated manholes where for special reasons the odors are found to be very obnoxious. Charcoal pans under the manhole covers have been tried, but not very successfully, as deodorizers of the sewer air passing through them. Shafts erected near manholes with perforated covers sometimes produce down drafts through the manholes, thus introducing fresh air into the sewers as well as withdrawing the foul air. These shafts are simply partial applications of the principle underlying the second method of ventilation described above, the use of chimneys adding the heat of the furnace gases as another force to aid in producing a current of air in the right direction. They are successful in proportion to their number as compared with the foulness of the sewer if they are properly designed and located. They have often been complete failures. Perhaps on account of the larger number of old and defective sewers, the question of sewer ventilation is more troublesome in English than in American cities and there are many special devices on the English market for ventilating sewers or deodorizing the sewer air, for which Americans find little use.

This is a case where prevention is better than cure and all modern practice in designing sewers and in cleaning them is based upon this principle. The frequent addition of fresh air or escape of sewer air through the perforations in existing channels connecting the sewers with the surface dissipates the slight odors which are produced in a well designed and maintained sewer.

Catch-basins or storm water inlets at the curb are not as satisfactory ventilators as manhole covers, especially if the sewers are somewhat defective, for the sewer air comes in greater volume and is released too near residences and passers-by to be dissipated before its presence is made manifest.

DISCHARGE THROUGH PIPE.

We have a ¾-inch tap in our pump room, a 1-inch pipe 100 feet long runs to a reservoir 8 feet above the top, and has a ¾ bend and an ell in its length. At its end it is reduced to a ½-inch nipple. What is the flow per hour with 80 pounds pressure at the tap?

Emanuel Dixon, Linton, Ind.

This is a good problem for exercise and is submitted to our readers with the inquiry how much the discharge differs from 960 gallons an hour.

LEAD WINDOW WEIGHTS.

Can you tell us where we can get lead window weights? *Hjerpe & Munson, Galesburg, Ill.*

If you have no local foundry which can furnish them, write to E. W. Blatchford & Co., 70 N. Clinton street, Chicago, Ill., The National Lead Co., of Chicago, St. Louis, etc., Raymond Lead Co., 51 W. Lake street, Chicago, etc.

MUNICIPAL MATTERS IN COURT

Higher Courts—Rates—Assessments—Valuations—Guarantees—Street Railway—Power—Sewer Service—Bonds—Road Roller a Traction Engine—Mnnicipal Ownership.

Abstracts from Decisions of the Higher Courts.

Prepared by Andrews & Murdoch.

Compliance With Contract for Street Improvements.—The law requires substantial compliance with the specifications contained in a contract for street improvements, in order for the tax bills issued to pay therefor to be collectible. Heman vs. Gerardi et al., 69 S. W. Rep. (Mo. App.) 1069.

Contracts for Improvements—Provisions.—A provision incorporated in the specifications for a street improvement that the workmen must be paid in cash, as provided by the labor law, and not in store orders, will not be held unreasonable where the constitutionality of such provision was not attacked below. People ex rel. North vs. Featherstonhaugh et al., 64 N. E. Rep. (N. Y.) 802.

Defective Sidewalks.—A city cannot escape liability for injury from a defective sidewalk because the defect is part of the original plan of construction. Stone et ux vs. City of Seattle, 70 Pac. Rep. (Wash.) 249.

Defects in Public Way.—Though a city may be liable for the defective condition of a portion of the traveled roadway so near the line of a street as to induce the belief in one passing along the street and exercising reasonable care that he is within the limits thereof, it owes no duty to see that a path or driveway made on private property by the public in walking or driving across the same is safe from an obstruction existing on private land, but so near to the path or driveway as to constitute a source of possible danger. Sweet vs. City of Poughkeepsie, 78 N. Y. Supp. 60.

Failure to Place Warning Lights.—A pedestrian fell in the nighttime into an excavation made in a street by a city contractor in laying a sewer. The sewer had been in the course of construction for some weeks and during that time the contractor had given warning of the excavations by placing lights on quitting work each day. On the evening of the accident he failed to put in place the customary lights. The city learned that the lights were not in place at about the time the accident happened, and then took immediate steps to place them. Held, that the city was negligent, since it was bound to see that the signals were in place on each recurring night. Drake et ux. vs. City of Seattle, 70 Pac. Rep. (Wash.) 231.

Liability for Injuries in Exercise of Public Functions—A statute annexed a part of a city to a town, and provided that the public property of the city in the annexed territory should become the property of the town, and that the town should pay the city the cost of water mains laid in such territory. Held, that the town was not liable for injuries sustained by one falling into an unguarded ditch in the highway, dug for the purpose of taking up the disused water mains; the town acting in a public capacity. Stockwell vs. Town of Ruthland, 53 At. Rep. (Vt.) 132.

Notice of Defect to Render City Liable—The question of the length of time necessary to charge a municipal corporation with knowledge of a defect in a public way is one of fact, and in a much-traveled street the conditions and surroundings may be such that two or three weeks will be sufficient. Sweet vs. City of Poughkeepsie, 78 N. Y. Supp. 60.

Paving Contract, Agreement for Repairs—A contract for paving a street with asphalt contained a provision that the contractor would keep it in repair without expense to the city for eight years. Held, not invalid as placing the cost of repairs on the adjoining property owners, but merely a guaranty as to the quality and character of the pavement. People ex rel. North vs. Featherstonehaugh et al., 64 N. E. Rep. (N. Y.) 802.

Prescription Against Municipality—Prescription does not run against a municipal corporation in regard to land held for the benfit of the public. Accordingly, where a certain strip of land is conveyed to a municipal corporation for use as a public street, and the authorities accept the deed, but open and use but one-half, longitudinally, of the land, adverse possession of the remainder by a private individual cannot ripen into a prescriptive title, although such possession is under

a deed from the dedicator subsequent to the deed to the municipality. Norrell vs. Augusta Ry. & Electric Co., 42 S. E. Rep. (Ga.) 466.

Public Contracts—Subletting—Contractors for city work agreed to furnish all the material, labor and apparatus necessary and to pay for all labor and materials used thereon, and the contractors executed a bond to the city "and for the use and benefit of any person who may be aggrieved by breach of the bond, or any condition therein." The contractors sublet a part of the contract to F. & Co., who purchased material from plaintiff and executed an order on the contractors for the amount due F. & Co., which the contractors accepted. Held, that the order constituted an assignment of the account of F. & Co. against the contractors and entitled plaintiff to maintain an action on the contractors' bond for the amount due thereon. Since the contract and the bond did not forbid subletting, and did not restrict the contractors as to the manner in which they should procure the doing of the work or the furnishing of the materials, the fact that sureties had no knowledge of, and did not consent to, the employment of F. & Co. was immaterial. Hines et al. vs. Consolidated Coal and Lime Company, 64 N. E. Rep. (Ind.), 886.

Right to Cross Street at Any Point—A pedestrian is not confined to the footway crossing, but, if ignorant of any danger, may cross a street at any point that suits his convenience, without imputation of negligence. City of Louisville vs. Johnson, 69 S. W. Rep. (Ky.) 803.

Tree Standing Within Sidewalk Line—A tree twenty-four inches in diameter standing two feet within the sidewalk, and an obstruction to travel thereon, is subject to removal by the city in the course of proposed improvements within the proper street limits. Hildrup vs. Town of Windfall City et al., 64 N. E. Rep. (Ind.) 942.

Water Supply—Pumping Stations—In a suit against a city to prevent a continuing trespass, and for damages caused by the lowering of the water level under defendant's land by the establishment of defendant's pumping station near the land, an award of fee damages was not objectionable on the ground that it was an award of the depreciation in value of the remainder of the property after the water was taken from it, but contained no award for the water, since plaintiff had no property, but only an usufructuary right in the water and fee damages included the deprivation of this right. Westphal et al. vs. City of New York, 78 N. Y. Supp. 56.

A Barrett Law Decision in Indiana.

The appellate court decided Nov. 18 that a lot-owner in Indianapolis that failed to pay one installment under the Barrett law when due in November, but paid it the following January, before any action had begun, cannot successfully defend against an action to foreclose the lien for the entire amount of the assessment. The decision is a very important one, for under the Barrett law a single delinquency creates a liability that the lien for the entire amount of the assessment may be foreclosed.

Application of Front Foot Rule Defined in Oswego, N. Y.

Oswego, N. Y., recently lost a lawsuit which may prove far-reaching in its effect. The suit was one brought by a citizen to set aside assessments for asphalt pavements and connecting water, gas and sewer mains with his property. The assessment was made according to the front-foot method, and this plan is held illegal except where all property in front of the proposed improvement is of equal value. It is also held that the city has no right to compel putting in gas, water and sewer connections without first securing the consents of one-half of the property-owners. Within the last six years Oswego has put down $300,000 worth of asphalt pavement and assessment has been made along the lines just declared illegal. It is expected that every property-owner along the streets where the pavement has been laid will commence actions to have the assessment set aside.

Pavement Guaranty Clause Upheld in Erie, Pa.

The city of Erie, Pa., has just won a test paving case involving assessments of more than $45,000. The decision was handed down by the superior court sitting in Pittsburg and reversed that of Judge Walling, who granted a compulsory nonsuit against the city in March. The case appealed was that of the city of Erie vs. a piece of land fronting on Third-st., and the point passed on was a clause in the contract between the city and the contractor for paving, requiring the contractor to keep the pavement in perfect order and repair for ten years from the date of completion. The property-owners contested the assessments on the ground that the city could not make such a contract, and charge them with the cost of keeping the pavement in repair, in addition to the original cost of the pavement.

It seems that the plans and specifications for paving Third-st. made no mention of repairs, but provided for a ten-year guaranty. The contract was awarded to John J. McCormick & Sons, who executed a written contract containing the provision, in addition to the guaranty that they would keep the pavement in repair for ten years, without further consideration than that mentioned in the bid. This provision furnished the basis on which suit was brought, the defendants alleging that the repair clause increased the burden on the property-owner.

Street Railway Franchises in Los Angeles, Cal.

A decision was rendered by Judge Olin Wellborn of the United States circuit court, Nov. 1, in which he upholds the action of the city council of Los Angeles in denying freight carrying street railway franchises to the Pacific Electric Company and the Traction Company. The case grew out of an advertisement for sale of a street railway franchise in the Sixth and Seventh wards from the south city limits to the down-town district on the application of the Pacific Electric Company. The bids received were as follows: Pacific Electric Company, $25,000; William S. Hook, $37,500; E. A. Davis, $139,000; E. Murray, $415,000. The franchise was given to Murray, who failed to make good his bid within the twenty-four hours allowed by law. The bid of E. A. Davis, the next highest bidder, was urged for acceptance, and the money was deposited. The council then declared Murray's bid to be fraudulent and void and accepted a 10 per cent. raise from the Pacific Electric Company over the $139,0 bid of Davis, and awarded the franchise to this company. The ordinance granting the franchise was passed, but Mayor Snyder vetoed it, and when returned it failed of the necessary vote and the council declared the entire proceedings off. The Pacific Electric Company brought suit to enforce its alleged purchase of the franchise, in the United States circuit court, making the city, the Traction Company, and all the bidders defendants. It was alleged that all the bids other than its own were made by the Traction Company as a combination to defeat competition, and as a fraudulent means to secure the franchise.

Judge Wellborn holds that the council in refusing to accept the bid of the Traction Company, made by E. A. Davis, had the power to do so, but, having so acted, and the raised bid of the Pacific Electric Company being wholly improper, the entire proceedings then fell and a re-advertisement of sale was the only thing that could have been done.

Riverside, Cal., Must Furnish Street Railway Power Below Cost Under Its Contract.

A decision was handed down by Judge Olin Wellborn in the United States district court, Nov. 1, restraining the city of Riverside, Cal., from cutting off the power of the Riverside and Arlington Street railway. The board of trustees passed a resolution about a year ago declaring that thereafter the street railway company should pay the city actual cost of power instead of the contract price agreed upon between the company and the city at the time the street railway was built. The contract provided that the city was to charge the street railway company $500 a year for the first three years of the contract, $1,500 for the next two years, $2,400 for the next three years and $3,700 a year thereafter. The contract covered a period of twelve years. The city fixed Nov. 5, 1901, as the time after which the power should be shut off from the street railway company's lines in the event that the company had not complied with the city's demands before that time. The company secured a restraining order and instituted suit in Judge Wellborn's court to compel the continuous delivery of power to the company on the terms of the original contract.

The city claimed that the contract made with the street railway company was ultra vires, the city having no power to serve the company at less than actual cost, and, moreover, that the purpose of establishing the municipal electric light plant was for lighting purposes alone and that the city had no legal right to furnish the street railway company with power. The city interposed a demurrer to the action brought by the street railway company claiming that the court had no jurisdiction; that the bill is without equity, and in their briefs urged, under the first cause, that the bill neither showed a federal question nor a matter of adequate value in dispute; under the second cause, that the contract between the railway and the city of Riverside was ultra vires and void.

The contentions of the company are sustained upon practically every point and the city will be held to fulfill the provisions of the contract as entered into with the railway company. Regarding the point as to the right of the city to sell power to the company, Judge Wellborn says:

I am of opinion that the city of Riverside, by virtue of the legislative grant of power above quoted, and under its contract with the Redlands company, re-

spectively, had authority to, and did acquire electric power for each of the purposes indicated.

The purposes indicated are:

To use or dispose of such power to private citizens to use for any purposes whatever, within the corporate limits of Riverside.

Bearing further upon the point of the city's right and contracted obligation to furnish power to the street railway, the decision says :

Bearing in mind that the acquisition construction, maintenance, and operation of street railways are among the declared purposes of the city's organization, the conclusion seems to be unavoidable that the said contract was within the scope of the city's powers and that its obligations cannot be terminated or changed by any subsequent increase in the demand for electric lighting. Whether or not the bill shows such an increased demand as indicated, I am in doubt, but, assuming that said fact does appear, I hold that said contract is unaffected thereby.

Ruling on Taxable Valuation of Street Railway in New Jersey.

In an opinion handed down by Justice Dickson of the New Jersey supreme court Nov. 10, he sustained the action of the state board of taxation in reducing from $2,075,000 to $1,240,979 the assessment of the North New Jersey Street Railway Company in the city of Newark.

The case grew out of the action of the board of assessment and revision of taxes of this city in fixing the assessment for taxes of 1901 upon the North Jersey Street Railway Company at $3,100,000. The commissioners assessed this amount on the advice of the law department, after the court of errors and appeals had overruled a previous assessment for a like sum made for taxes of 1900, which assessment was based on the contention that the property of the railroad company in the streets of the city and permanently affixed to the soil constituted real estate, and was taxable as such in the same manner that all real estate is taxable under the law. In making the assessment for 1901 the local board took the ground that while the court of errors and appeals had reversed the position of the city, it did so because the assessment was erroneously based. The local authorities maintained that the court actually sustained the view taken by Justice Garrison in a minority opinion that the property of a street railroad company affixed to the soil of a public street was not real estate, but must be considered for purposes of taxation as a whole property in its permanent enviornments. Acting in this assumption the local board divided the assessment against the North Jersey Street Railway Company last year, but the total sum of the divisions was equal to the assessment of $3,100,000 which was overthrown the year before. Of this amount the sum of $2,075,000 represented the value of the property affixed to the sale of the streets of Newark, including the rails, ties and overhead construction. The North Jersey Company appealed from this assessment to the state board of taxation on the same ground that the prior appeal had been made. The state board of taxation decided that the value of the property assessed by the local board at $2,075,000 was $1,240,979. This amount was equal to what the assessment would be if the cost of reproduction with an allowance of 14 per cent. for depreciation of value had been made the basis of original assessment. The state board of taxation refused, however, to certify or to declare upon what ground it based its ruling. The city attorneys thereupon applied for a writ of certiorari on the ground that the ruling of the state board was contrary to law and the decision of the courts. Judge Dixon sustained the action of the state board, but said its determination is not reviewable by the court; that the amendment of certiorari relates only to mode of review and does not enlarge power to review granted to the court.

Decision in Chicago Drainage Canal Power Case.

Judge R. H. Hilscher of the Mill county circuit court decided in favor of the drainage trustees, Nov. 7, in their suit against the Robert Gaylord syndicate, which endeavored to obtain by condemnation proceedings the water power privileges of the drainage district at Joliet.

Judge Hilscher said:

I have not prepared an opinion discussing the various questions raised and the argument of this motion for the reason that the conclusion I have reached renders it necessary that the questions involved be submitted to the supreme court before any further steps be taken in the proceedings. Admitting the constitutional right of petitioners in a proper case to take private property by condemnation for a grist mill and navigation purposes in order to make the case a proper one the purpose of such taking must be for a public use.

It is clearly the duty of the court in this kind of a case to determine whether the purpose of taking is for a public or private use. If the purchase is in fact for a private use, though under cover of pretense for a public use, then it is the duty of the court to deny the exercise of the right of eminent domain.

After a careful consideration of the petition and evidence and the authority cited as well as the mill act and the sanitary district district act and the well-known industrial conditions, of which it

is the duty of the court to take notice, I am led to the unavoidable conclusion that the purpose of the determination as sought in this case is not to acquire property for a public use, but is to acquire public property for a private use.

Even if the public use be admitted, I have the most serious doubt as to whether the use to which it is proposed to put the property sought to be taken is not inconsistent with and destructive of the public use for which it was acquired and is held. The motion to dismiss will therefore be sustained.

An appeal to the supreme court has been granted the Gaylord syndicate, and they expect the case to be considered at the December term.

What Is Convenient Proximity to Sewer?

A decision was rendered at Nashville, Tenn., Oct. 30, by Judge Buchanan, in which he holds that a sewer nearly 200 feet from premises is not in "convenient proximity" to make drainage connection. The defendant, who had been served with several notices instructing him to make sewer connections, testified that his lot was 168 feet deep and 36 feet front, and that a house extended across the entire Market-st. front of it. The nearest sewer was across Market-st., nearly 200 feet from the vault in the rear of the premises. To run the pipe it would be necessary to go through the foundation walls and a cellar under the house.

The city has appealed to the circuit court.

Cedar Rapids Sewer Bonds Valid.

The Iowa supreme court rendered an opinion Oct. 27, affirming the decision of Judge Rothrock in the superior court in the suit of Grunewald vs. City of Cedar Rapids, Nancy Reed, intervenor. The city awarded a contract to Ford and De La Hunt for constructing a storm water sewer for $102,767. In conformity with legislative enactment the city arranged to issue bonds to run ten years and to be paid by the proceeds of a special levy for such purposes. To test the validity of the action Grunewald brought a friendly suit before Judge Rothrock. Nancy Reed intervened on the ground that the merits of the case were not likely to be brought out by Grunewald; that his action was in behalf of the city instead of against the city. Judge Rothrock decided in favor of the city and the case was appealed. The supreme court holds that the city has not exceeded its authority; that the bonds may be issued and paid as arranged, and that the construction of storm water sewers, under the conditions, cannot be stopped by pleading the limit of debt.

Pana, Ill., Restrained from Erecting Lighting Plant.

In an opinion handed down Nov. 6 in the injunction suit of Robert Johns vs. the city of Pana, Ill., Judge Farmer restrained the city from erecting a light plant for lighting the streets and for other purposes. The city council voted, several weeks ago, to erect a light plant. Robert Johns, owner of the Pana Modern Electric Light company, secured an injunction restraining the city, claiming that the erection of a plant would exceed the constitutional limit of indebtedness. The city has been in darkness ever since the suit was filed, pending the decision of the court. The city will fight the case. T. C. Reed of St. Louis had the contract for the improvement, which was to cost $16,000.

Steam Road Roller Subject to Traction Engine Regulations.

A jury verdict was rendered in the Circuit court at New Albany, Ind., Nov. 22 in a damage suit, in which it was held that a steam road roller used on the streets of the city was a traction engine and should be governed by the laws of the state relative to traction engines. Several months ago, while exercising his horses, a member of the fire department was thrown from one of them and injured. He alleged that the horses became frightened at the steam roller, which was being used on the streets. His attorney contended that the street roller was a traction engine and he was sustained in this by the verdict rendered. The state law requires that while traction engines are being run over public highways they must be preceded by some person a certain distance ahead of them to warn drivers of horses of their approach. The city will appeal.

Cedar Rapids Can Fix Water Rates.

In an opinion handed down by the Iowa supreme court, Judge Weaver reversed the decision of Judge W. N. Treichler of the Linn district, in the case of the Cedar Rapids Water Company, appellee, vs. the city of Cedar Rapids, appellant. The action was one in equity to restrain the city from enforcing an ordinance fixing rentals for water in Cedar Rapids. The company had been granted a 25-year franchise in 1876 and when this ran out the council endeavored to regulate rates. A number of questions were at issue, one of which was the company's contention that it had a perpetual franchise, regardless of the 25-year limitation. The company claimed the rates were insufficient to give adequate return on its investment.

The supreme court holds that the franchise expired at the end of 25 years; that the city has power to regulate rates; that the ordinance of the city of Cedar Rapids provided adequate rates. It refused to concede the point frequently contended for by corporations holding franchises—that long possession and use of a franchise which a city is powerless to grant constitutes a color of right. The court found the net earnings of the company would be 5½ per cent. on the total amount of stocks and bonds, and holds the rates therefore commensurate. It says:

The court cannot undertake to guarantee the company any fixed or certain realization upon its investment. The exercise of such a power would work to the utter destruction of the legislative right to regulate rights of water companies and other corporations operating works of public utility.

Lighting Rate for Denver Established

An opinion was handed down by Judge M. S. Bailey of the district court at Canon City, Col., Sept. 11 establishing rates for the light consumers of Denver. He held that the rates for the Lacombe company must stand at least for the present, as the rates to be charged consumers by the Denver Gas and Electric Light Company. Judge Bailey held that the Lacombe schedule would be given a fair trial, and be subject to revision at any time in the discretion of the court.

The old company made a charge of 50 cents for each incandescent lamp and then charged 2½ cents for each kilowatt of current used. The Lacombe company made no charge for readiness to serve, or lamps, and charged 10 cents per kilowatt. The commission appointed by Judge Bailey to investigate and report to the court what would be a fair schedule of rates suggested a maximum rate of 13½ cents per kilowatt hour and a maximum rate of $1:50 a month.

Municipal Plants Are Trusts.

The supreme court has affirmed a judgment enjoining the city of East Chicago from paying water rents to the Lake County Water and Light Company and declaring void a deed by which the officers of the city had conveyed its water works to that company. It is held that a city may not dispose of public property unless it be specially authorized by law to make such sale or disposition. Water works and electric light plants owned and maintained by cities are to be regarded as property held in trust for public use, and not subjects of sale as private property, or to private corporations.

Ohio's Municipal Code Upheld.

The first attack on the constitutionality of the recently enacted municipal code for Ohio has met with defeat in the court of common pleas at Cincinnati. The case was brought at the request of a taxpayer to test the law. The plaintiff's demurrer to the answer was overruled, thus sustaining the constitutionality of the law on all the points raised. Among these was that the law was not uniform in its operation and that it was not legally passed. The case will be appealed to the circuit court and then taken to the supreme court that the point of constitutionality may be finally settled.

STREETS AND PAVEMENTS.

Bridges—Elevated Tracks—Oil for Streets—Convict Labor—Crossing Signals—Cleaning—Washington Improvements.

Portland, Ore., Bridge Construction Prevented by Its Charter.

Nearly three miles of bridges and elevated roadways by which the streets are extended across the sloughs and bottom lands which parallel the Willamette river and across the many deep gulches which cut the higher lands have been condemned by W. C. Elliott, city engineer at Portland, Ore. Nearly all of them were built fifteen and twenty years ago. The city has no funds to pay for repairs or rebuilding, and the present city charter makes it impossible to have the work done at the expense of the property-owners. The only relief lies in the adoption of a new charter by the legislature.

Elevation of Railways in Harrison, N. J., and Oneida, N. Y.

The town council of Harrison, N. J., passed an ordinance Nov. 6 granting the Lackawanna Railroad Company the right to proceed with the work of elevating its tracks. The ordinance fixed the terms on which the work shall be done. The coun-

cil also read twice and ordered to a third reading ten other ordinances providing for the vacation of certain streets and the depression of others in connection with the railroad improvement.

The state board of railroad commissioners has appointed Dec. 4 as the time for meeting in Oneida, N. Y., to continue the hearing of the application made for the city for the elimination of the grade crossing at the intersection of Seneca-ave. with the tracks of the New York, Ontario & Western railway.

Treatment of Pavements.

The Washington Star breaks into rhyme upon the subject of the disturbance of pavements in a way which will suit the conditions in all American cities. Four stanzas read as follows:

They took a little gravel
And they took a little tar
With various ingredients
Imported from afar.
They hammered it and rolled it
And when they went away
They said they had a pavement
That would last for many a day.

But they came with picks and smote it
To lay a water main;
And then they called the workmen
To put it back again.
To run a railway cable
They took it up some more;
And then they put it back again
Just where it was before.

They took it up for conduits
To run the telephone;
And then they put it back again
As hard as any stone.
They took it up for wires
To feed the 'lectric light,
And then they put it back again,
Which was no more than right.

Oh, the pavement's full of furrows;
There are patches everywhere;
You'd like to ride upon it,
But it's seldom that you dare.
It's a very handsome pavement;
A credit to the town;
They're always diggin' of it up
Or puttin' of it down.

Santa Barbara's Treatment of Streets With Oil.

In the use of oil on streets the city of Santa Barbara, Cal., has met with a considerable degree of success. A number of streets have been treated with oil until they present a surface hardly inferior to asphalt pavement and from present appearances these streets seem to be permanently built. This condition has been brought about largely through a Californian's invention, a roller adapted for finishing the work of oiling. It consists of a large wooden roller set with numerous spikes several inches in length, which cut into the earth, carrying the oil beneath the surface for a depth of four inches. By successive rollings the oil and earth are thoroughly mixed and a steam roller passing over the loose surface packs it to the required degree of hardness. Santa Barbara is well pleased with the streets thus treated which, while meeting all the requirements of paved streets, cost comparatively little to construct.

Use of Oil in Street Construction.

Thomas N. Badger, engineer of the town of Emeryville, Cal., has adopted the following specifications of macadam streets, the distinguishing features of which are the use of oil in completing the surface of the pavement and the rattler test of the stone to be used.

All macadamizing shall be done only with hard rock, of igneous character, known as hard blue trap rock, or hard gray trap rock, which shall lose by abrasion and fracture not more than twenty per cent. of its original weight when subjected to the rattler test, which test shall consist of placing one hundred and twenty-five (125) pounds of the macadamizing rock crushed to pass through a two and a half (2½) inch circular ring in the machine known as the rattler, belonging to the State University or some similar machine, and revolved at the rate of twenty-eight (28) revolutions per minute, as nearly as practicable for 5,000 revolutions.

After the grading and rolling of the street to the proper subgrade, as prescribed heretofore, a layer of rock eight inches in thickness, crushed to pass through a two and a half ring, shall be spread evenly over the street, which shall then be rolled with a light roller and made to conform to the section hereto attached and made a part thereof, after which a layer of one inch of screenings shall be applied to the entire street surface. The whole then to be well watered and thoroughly rolled with a roller of not less than ten tons weight.

After such watering and rolling, it shall be allowed to stand undisturbed for a period of twenty-four hours, when it shall be coated with crude mineral oil of twelve to fourteen gravity (Beaume), containing not more than two per cent. of water. The oil shall be applied at a temperature of 200 degrees Fahrenheit; the roadway shall be dry and the sun shining at the time of its application, and the ratio of application shall be one gallon of oil to one square yard of street surface.

The application of oil shall be immediately followed by a layer of sand half

an inch in thickness, to be evenly spread over the entire oiled surface. Great care shall be exercised to prevent the application of oil to the crosswalks, and one side of the street shall be completed before commencing work on the other side.

Oil on English Road.

A successful experiment with oil has been made on a portion of the London & Southampton road, between Farnborough and Aldershot, according to the Surveyor. The work was under the supervision of the county surveyor of Hampshire, who laid 2,500 gallons of Texas heavy oil on three-quarters mile of road, commencing at the thirty-second mile stone from London. Several dressings were given, the oil being first distributed by means of a watering cart and subsequently, in order to secure an even distribution, the men went over the length with watering cans. The oil soaked quickly into the road and left the surface well knit and firm, and the treatment was immediately successful in preventing dust. A large number of motor cars passing along the road on the next Sunday failed to raise any dust whatever on the oiled portion, but immediately after passing that portion of the road they disappeared in a whirlwind of dust.

Street Car Company Seeks to Protect Itself and the Public.

The St. Louis Transit Company has adopted a plan whereby it hopes to reduce the number of street car accidents and incidentally the number of damage suits against the company. An annual bonus of 1 cent an hour, amounting to about $36 a year, will be paid to every motorman and conductor who goes through the year with no accident to his car. One accident will act as a forfeiture of the entire bonus. A crew, consisting of motorman and conductor, must work in harmony, for carelessness on the part of one will forfeit the other's as well as his own bonus. It is hoped that the scheme will obviate the necessity for fenders, as it will undoubtedly promote carefulness and efficiency among the employes.

A City Governed at Little Cost.

The salaries of its municipal officers do not drain very heavily upon the city treasury of Hoopeston, Ill. Its mayor, Jacob S. McFerren, who established the precedent in the office since 1877, draws a salary of 50 cents a year, while the four aldermen receive half this amount in return for their services. Hoopeston, which is a city of about five thousand population, has many miles of paved streets, electric lights and a $100,000 water works plant. Mayor McFerren recently presented to the city an expensive piece of property for a park.

Street Crossing Signals.

The United States consul at Leipzig has given the secretary of state an account of the system of signaling at electric car crossings in that city as follows:

Until a few months ago the method in vogue in this city of avoiding accidents at crossings of electric street railways was either to station a flagman at the crossings or to have the conductor run forward to see if the other line was clear. An automatic signal lantern has been introduced by the street railway company, which does away with these inconvenient methods. The lantern consists of two boxes, arranged one above the other, each having two sides fitted with red and the other two with green glass, the red being above the green. The cars on one line cause the incandescent lamps in the upper box to burn; the cars on the other line the lamps in the lower one. This causes, owing to the arrangement of the glass in the boxes, a green light to appear to the first line, which indicates 'free passage,' and a red light to the second line, which means 'stop.' Signals are also visible in daytime, as reflectors shut out the light of the sun, and the lantern is well lighted from the inside.

Bertillon System Applied to City Employes in New York.

The municipal civil service commission of New York City adopted Nov. 19 the Bertillon system of measurements to ascertain the identity of any man employed by this city. The practice of certified laborers in the street cleaning department selling their cards to men who, in some instances, were non-citizens, who assumed their names, led to this action.

Cleaning Asphalt.

Experiments in street cleaning were made in New York recently to prove that automobiles slipped on asphalt pavements, not because the streets were wet, but because, after they were sprinkled, they were not properly cleaned.

The first part of the program was to sprinkle ten blocks of the Fifth-ave. asphalted pavements. This was done with the five new "flushers." Each flusher sprinkled two blocks, so that within ten minutes the entire distance from Twenty-fourth to Thirty-fourth-st. was wet. After the flushers came the "squeegees," to clean off all the dirt loosened by the flushers. A flusher looks like an ordinary street sprinkling cart except that the water, instead of spraying outward from the vehicle, goes straight down by means

of pneumatic pressure. The expectation was that the air pressure machines could wash the asphalted pavements with such force that they would loosen nearly all of the dirt. The squeegees were employed as a supplemental safeguard.

Two kinds of squeegees were used. The first kind was drawn by two horses. A horse squeegee consists simply of a rubber scraper supported by wheels, and was designed to do much more work than the hand squeegees used by the laborers. The hand squeegees are nothing more than rubber scrapers with long handles. It was conceded after the trial that the pavement scraped by the hand squeegees was mmuch cleaner than that scraped by the two-horse squeegees.

As soon as the ten blocks of pavement were cleaned three automobiles and a motor bicycle began experimenting. A two-seated vehicle went at a good speed, about right for turning without slipping on dry, clean pavement. But it did slip. It slid and described a semicircle while sliding. The next auto was a little heavier and did not slide so much. It described a quarter of a circle while skating. A big, heavy racer got better results than either of the two lighter autos. It slid but little. A motorcycle rider decided that his tires did not have a firm enough grip on the pavement to warrant a motorcycle in turning around. He dismounted without running any risk.

The experiments were later shifted to Fifth-ave., between Eighteenth and Twenty-second-sts., which was then merely sprinkled without having the pavement cleaned with squeegees of any kind. At once it was seen that there was a great difference in the slipperiness of a cleaned and an uncleaned pavement.

On the wet but uncleaned pavement even the heavy automobile slid every time it tried to turn, although on the cleaned pavement its turns were satisfactory. The motorcycle rider was afraid to ride at all on the uncleaned wet pavement, whereas on the cleaned wet pavement he could ride with safety but did not care to risk a turn.

Capt. Gibson, deputy street commissioner, said that even better results would be obtained by the flushers in cleaning streets where a better hydrant pressure could be obtained. On Eighth-ave., he said, the hydrant pressure was much better, and in filling up the water tank under pressure the result was that the flushers had much more force. Capt. Gibson added:

The experiments this morning proved that pavements cleaned after wetting are better for automobiling than those merely sprinkled. Within half an hour after pavements are properly scraped with squeegees they are dry. The temperature this morning was 35 degrees, and of course the pavements did not dry as quickly as they would have done in warmer weather.

Convict Labor Proposed for Illinois Roads.

A scheme will be presented to the next Illinois legislature which provides for a boulevard system to connect Joliet with Chicago, to be constructed by convict labor.

A recent decision by Attorney-General Hamlin precludes the further employment of the convicts by private parties. This makes it absolutely necessary for employment to be provided for the men confined in the penitentiary, and it is believed that the greatest economy for the state, under the circumstances, will be to plan a series of state roadways and put the convicts to work on them.

A German Street Sweeper.

A new street sweeping device has been invented by a company in Dusseldorf. In a report to the state department, Consul Creevey at Glauchau, Germany, says the apparatus is a combination street washing and street sweeping machine and a mud dredger. The cylindrical brush draws the mud to the middle, instead of throwing it off to one side, as is now the custom, and carries it up through an inclosed chute by an endless chain of small buckets and drops it into a cart attached to the rear of the machine.

Public Improvements in Washington, D. C.

The annual report of Col. John Biddle, engineer commissioner of the District of Columbia, was completed Nov. 11. He earnestly urges that final action be taken this year on the bill for the Union station and abolishing grade crossings within the city. Attention is called to the serious condition of the Anacostia bridge, which was built in 1875 for ordinary traffic. In recent years an electric railway has been installed upon it, carrying heavy cars, a load it was never designed to carry. The roadway is entirely taken up by car tracks and the draw arrangement is out of date. The bridge is unsightly, too narrow and structurally unfit for the heavy traffic enforced upon it. He submits an estimate for rebuilding it. The principal bridge built during the year was the boulder-faced bridge in Rock Creek park at a cost of $17,635.77. The masonry arch of the Massachusetts-ave. bridge across Rock creek was completed at a total cost of $132,005.82. During the year 50,218 square yards of sheet asphalt,

29,859 square yards of asphalt block and 40,276 square yards of macadam paving were laid. The price paid for sheet asphalt was $1.72 and for asphalt block $1.77. For the coming year the prices will be $1.56 to $1.64 a square yard for sheet asphalt, according to the base, and for asphalt block $1.66 a square yard on gravel base and $2 on natural cement base. He says that one of the most troublesome defects in asphalt pavements is the rolling or buckling of the surface, which is noticeable upon nearly all the streets in the District of Columbia, where this pavement exists, and where asphalt is so generally used as it is here the question becomes a serious one, since it has a direct bearing upon the life, usefulness and cost of repairs of the pavement.

During the present year it is, therefore, the intention to use an asphalt which is, either naturally or artificially, reasonably free from soluble salts, in the expectation of considerable improvement in the pavement. That this will prevent the action of water on the pavement is not as yet an established fact acknowledged by all, but the indications in the District of Columbia are that way, and its great importance warrants any trial that may lead to better results.

The price paid for cement sidewalks last year was 89 cents a square yard and $1.07 upon streets in the country not provided with roadway pavements. The prices this year are $1.04 and $1.11 a square yard, respectively. The increase in price is due to the increased cost of materials, particularly of cement. During the year 73,313 square yards of cement sidewalks were laid, which was 6,000 yards more than was laid the preceding year.

Contracts have been let for the pumping station and for the principal remaining trunk sewers and the work is under course of construction.

Attention is called to the proposed installation of a high pressure fire service in the business section of the city, of which he says: "This service would add materially to the fire protection of this important part of the city, and work upon it should be started as soon as funds can be provided for the purpose."

WATER, LIGHT AND SEWERS

Contracts—Tests—Electrolysis—City Water Supplies—St. Louis Exposition—Rochester Lights—Rates—Central Stations—Free Engineering—Public Convenience Station—Double Bond Issue.

Standpipe Test in a New York Sky-Scraper.

New Yorkers recently witnessed an interesting exhibition when the standpipes in the new "flat-iron" building at Broadway and Fifth-ave. were tested. One of the two engines used is the largest in the country and was built at a cost of $6,000. The lines of hose were attached to a six-inch standpipe on the thirteenth floor of the building. Tests were made on each floor from this up to the twenty-third. According to Chief Croker the test was successful and the result beyond expectations, as a pressure of forty-seven pounds was registered on the gauge behind the stream thrown from the twenty-third story. It was not expected that a pressure to exceed sixteen pounds could be recorded at the top of the building.

Right of Chicago to Fix Suburban Water Company Rates Attacked.

A petition has been filed in the circuit court by the Rogers Park Water company asking that the ordinance of the city of Chicago, providing that the water company shall not charge a higher rate for its supply of water than the rate charged by the city of Chicago, be declared void. Also, that the city officials be restrained from enforcing the collection of penalties from the company, which are provided for in an ordinance amended Sept. 29. The company sets forth in the petition that the rates prescribed by the city council for the water supplied by the petitioner are unjust and unreasonable, and impose a hardship upon the company. It says the rates charged are as low as the average rates charged for water by cities, villages and towns, as well as by private owners of water works which are operated under similar conditions.

Three Years' Extension of Time Is Asked on Cincinnati Water Works Contract.

The United States Construction Company has requested the Cincinnati commissioners of water works for a three

years' extension of time on its contract for the construction of the settling reservoirs, laying the pump mains for the Eastern pumping station, and for miscellaneous work connected therewith. The extension asked for dated from Dec. 1, 1902, to Dec. 1, 1905. The contract for this work was awarded to August J. Henkel May 16, 1899. After a number of delays, caused by controversies and litigation between the contractor and the board of trustees, Henkel turned the contract over to the United States Construction Company. The matter has been referred to the chief and advisory engineers for a report and recommendation

Preventing Electrolysis of Underground Gas and Water Pipes.

Cassier's Magazine for December, in discussing electrolysis, says that it has been suggested recently that damage to pipes from this cause may be averted by insulating the joints of the pipes at more or less frequent intervals so that they shall offer a poor path for the return of stray currents. It would seem, however, that this plan would be available at best only in the case of new pipe lines, or in single instances, for obviously it would not be practicable to disturb the entire pipe system of a city to insulate the joints. Besides, it has yet to be demonstrated that a durable insulating joint for gas and water pipes is procurable Vulcanized fiber has been proposed, and, in fact, tried with some success for such joints, but this material does not yet meet the general approval of gas engineers. Perhaps relief from electrolytic damage of the nature in question may ultimately come by the compulsory employment of the double trolley system, or by the adoption of the alternating current, when a practical alternating current system and single-phase motor shall have been evolved, in place of the direct-current systems and motors now almost universally employed for electric traction purposes. It is within the possibilities that this consummation is not so remote as may be generally thought, a single trolley railroad in which single-phase motors will be employed having already been contracted for to connect the cities of Washington, Baltimore and Annapolis.

Proposed Engineer Commission on Increase of New York Water Supply.

In a recent communication to Mayor Low of New York City Controller Grout urges immmediate action toward increasing that city's water supply and suggests the appointment of an unbiased commission of three engineers of acknowledged ability to take up the subject at once so as to finish their labors by Jan. 1. In conclusion he says:

I would therefore recommend to you that such a commission be appointed by you, after due authority is obtained; that, if possible, the services of John R. Freeman be retained, in order that his recent examination and thorough familiarity with the subject be taken advantage of; that the Merchants' association, which has taken such an active and earnest interest in the subject, be requested to propose a second engineer; that these two gentlemen select a third engineer to act with them; the chairman of the commission, ex officio, to be the commissioner of water supply, gas and electricity.

The scope of inquiry, it seems to me, should comprise: (1) The best source of supply for the immediate and distant future; (2) the most desirable method of procedure in order that the best results may be obtained at the earliest possible time; (3) the changes necessary to the existing system, which should be carried on simultaneously with the new work; (4) the probable cost during each succeeding year as the work progresses; and the commission to be instructed to report by Jan. 1 next, at which time it shall cease to exist.

To me this matter seems to be of such urgent importance that no time should be lost, especially in the preliminary steps necessary to be taken before any definite policy can be decided upon, and this is especially true if legislation is necessary, and it is for this reason that I have suggested Jan. 1 as the time when the commission shall finish its labors."

Cause of Great Waste of Water in Chicago.

The report of City Engineer Ericson, Oct. 10, showing that the waste of water is on the increase caused considerable alarm among the city officials of Chicago. Of 360,000,000 gallons of water pumped daily through the mains over three-quarters goes to waste, the actual proportion being 76.25 per cent. Only 15.25 per cent. is known to be legitimately consumed, which leaves 8.5 per cent. in doubt as to whether it is wasted or used. The report gives five distinct causes for this loss, as follows:

Defective joints and pipes in 1,900 miles of mains form one cause. The mains laid in annexed territories previous to annexation, mostly by contract under poor inspection, and mains laid under special assessment prior to 1898 unquestionably cause great leakage.

Electrolysis and deteriorated pipes are

also causes. Defective house-plumbing is another.

Defective, leaky and abandoned service pipes between the mains and the curb walls are another cause of waste.

Leaving the faucets unnecessarily open in the winter to prevent freezing and in summer to keep the water cool is one of the chief causes of leakage.

Overflowing tanks and leaky valves are contributory.

The adoption of the meter system is urged upon Commissioner Blocki as a means of stopping this waste, but this will not be taken up just at present. Commissioner Blocki's attitude on the meter question is shown in his answer to a request from the municipal authorities of New York City, Oct. 10, asking his opinion on the advisibility of the meter system, in which he said:

Meters will stop waste, but it seems unjust to force the consumers to bear the expense of their installation. Where the city can install them it should be done, but at present Chicago has not the funds. Here it would cost in the neighborhood of $2,000,000.

Progress on the Louisiana Purchase Exposition.

The designing of the scenic features of the St. Louis exposition is now nearly completed. The main buildings are grouped on a level area bordered on the south by a concave hillside about 1,600 feet across and 65 feet high, from which the avenues of the plat radiate. Three cascades, the largest artificial waterfalls ever constructed, a large cascade basin, 600 feet in diameter, and four fountains with 75-foot jets form the main features of the design for the improvement of the hillside. The main cascade, fed by a 30-inch pipe, will use 45,000 gallons a minute. It has fourteen falls each from 4 feet to 25 feet high and 3 to 11 inches deep. It will be illuminated at night. The two side cascades are fed by 12-inch pipes, each using 18,000 gallons a minute, discharged under a pressure of 90 pounds. The "Terrace of States" is another feature of this section.

The underground work of the exposition is all in place and in use, including water mains and branches, out fall pipes, pump wells and sewers.

Seven of the buildings, aggregating over $4,500,000 of contracts, are in process of construction in addition to the government building, and the contract for the tenth will be let in a few days. Others outside the main picture are also well advanced.

Electric Lighting in Rochester, N. Y.

The following notes upon the practice in the city of Rochester, N. Y., regarding electric lighting will be of interest. They were presented by Mr. E. A. Fisher, city engineer, at the recent meeting of the American Society of Municipal Improvements.

The city has 2,803 arc lights. Of these 2,347 are single arc lights placed at street intersections and more frequently in long blocks, so that their distance apart averages about 400 feet. There are 456 arc lights placed in pairs on the main streets about 250 feet apart. On a few street corners there are four of these lights, but usually only two. There are also 142 gas lights costing 8 cents a night for each. The total expense for lighting in 1901 was about $250,000. This seems like a large sum, but it justly gives Rochester the reputation of being the best lighted city in the country.

A new contract for electric lighting went into effect July 1, which reduces the price for the single lights from 25 cents to 21½ cents per light per night and that for the double lights from 20 cents to 18¾ cents per light per night. The single lamps are mostly open arcs of 2,000 nominal candle-power, requiring not less than 450 watts of energy at the light. They are in series on a high tension circuit limited to 6,000 volts. The double lamps are on iron poles on a 115-volt circuit and require not less than 360 watts energy at the lamp. The wires feeding these lamps are generally underground. Most of the low tension lamps are now of the inclosed arc type and all will be in time under the contract.

Jeffersonville's Lighting Troubles.

The question of public lighting in Jeffersonville, Ind., is a sorely troubled one. Some time since the plant of the Jeffersonville Light and Water Company was sold at sheriff's sale to the United Gas and Electric Company. Holding that it has no contract with the city, this company, the only organization in the place that has a light plant, has served notice that the current will be shut off on December 2, unless some arrangement is made to pay a fair price for the service. So lax has the city been in the matter of payment that for some months the employes of the company have been receiving their pay in orders on the city. Hundreds of dollars' worth of the orders have been cashed by the merchants who use them to pay their taxes. The result of this is that but little cash finds its way into the hands of the city treasurer.

Now comes another chapter in the case.

To satisfy a judgment of Thomas B. Rader, for the use of Edwin Bussit Smith, Sheriff Rave sold to the highest bidder, at the court house door in Jeffersonville, "one No. 23,993 ten-light Packard transmitter; one feed-roll pump; the contract entered into between the city of Jeffersonville, Ind., and the Jeffersonville Light and Water Company, by virtue of ordinance No. 506 of said city and the acceptance thereof, as well as by all ordinances or resolutions of the common council of said city amendatory thereof or supplemental thereto, including all franchises and privileges running to or created in favor of said company by virtue of said ordinances, resolutions and acceptances." The notice of sale specified that the property was taken as that of the Jeffersonville Light and Water Company.

The only bidder was M. Z. Stannard, the attorney, who was acting for another who is not known, and he offered $180, which was accepted. This makes Mr. Stannard, or the person he represents, the owner of the contract with no way to fill it, and the United Gas and Electric company the owner of the only lighting plant in the town, but having no contract to dispose of their output other than to private consumers for incandescent service. It is not believed a like condition exists in the country.

Electric Isolated Plants vs. Central Station.

It appears to be difficult to determine whether it is more economical, even in large cities, to operate an isolated plant for electric light and power, or to use a central station supply, so conflicting are the views held upon the subject and so admittedly indefinite is the information obtainable from those most capable of imparting that information. There is no doubt that the central station can develop electrical energy at a much lower figure than even a fair-sized isolated plant, perhaps at one-third less for coal alone, besides which the central station, as a rule, has a high load factor and improved facilities for economically handling coal and ashes, and thus has lower labor charges per kilowatt-hour than the isolated plant. There are, however, against these advantages the heavy losses in distribution between the switchboard at the central station and the consumer, which may be as high as 50 per cent, and rarely less than 20 per cent. It would at first seem that there should not be much doubt that the central station source of supply is cheaper than the isolated plant for small users of electrical energy, although even in this case the fact that the central station rate per kilowatt-hour is greater to the small user than to the large user is in favor of an isolated plant for the small user. Such statistics as are available show that savings have frequently followed the installation of comparatively small isolated plants. One thing that conduces largely to this result is that steam is necessary in a building for heating purposes, and thus, so far as the electric plant is concerned, labor charges are almost eliminated. The cost to the consumer of electrical energy from the central station supply, in American plants, ranges from four to fifteen cents per kilowatt-hour, depending on the conditions prevailing in each building. Where gas engines are employed to operate the dynamo the average cost per kilowatt-hour is somewhat higher. Notwithstanding these figures, however, the central station inspectors appear able to give convincing reasons why it is advisable to use their supply, as proved by the large number of isolated plants in some of the large American cities that have been shut down, their places now being taken by the central station supply.—Cassier's Magazine.

Free Electrical Engineering.

If a man is sick or if he needs legal advice he goes to the doctor or the lawyer, and no matter how intimate his personal relations with them may be he expects to get a bill for their services; he takes the payment for their skill and attention quite as a matter of course.

The chances are that if the same man happens to know an electrical engineer he will go and ask him all sorts of minor questions requiring considerable study for their proper answer, make requests for all manner of information, some of which have been obtained perhaps at considerable expense, and would be utterly horrified if he received a bill. And the strangest part about it is that nine engineers out of ten cheerfully render these services to their friends, or even their acquaintances, without the slightest thought of charging for them.

This state of things is inequitable and ought not to continue. An electrical engineer is a professional man by reason of study and of a costly education, in precisely the same degree as is the physician or the lawyer. His right to trade on his information, experience, knowledge, skill and trained judgment in matters having to do with electricity is perfectly similar to that of other practitioners of the arts and sciences, and no reason can be observed why his right to charge a

fee is not equal in all respect to theirs. There has been entirely too much free consultation and free advice given in this country. It may not be improper though to call the attention of our lay friends who read this to the fact that free advice is not the most valuable kind. The whole question of charges for service ought to be made the subject of a discussion, say at the American institute of electrical engineers' annual meeting, and some standard practice should be put in vogue that would stop the objectionable habit of free advice-giving, and doubtless increase to some degree the income of many engineers. It would also give, undoubtedly, a greater value both in actuality and in estimation to electrical engineering opinions.—Electrical Review.

Struggles of Santa Cruz Against Double Bond Issue.

Some years ago the city of Santa Cruz, Cal., issued some refunding bonds which were sent to Coffin & Stanton of New York to take up outstanding bonds. The firm sold the bonds, but did not take up the old bonds, failing meantime, and the banks which were their security also failed. The total amount at issue seems to be about $300,000 with interest for forty years. The test case was won by the city in the lower court, but lost in the United States supreme court, on the ground that the present holders of the bonds are "innocent purchasers." Order to levy tax to pay the amount due on the bonds included in the suit has been issued, the sum to be collected under this order being $22,000. The taxpayers are considering the possibility of refusing to pay taxes. Recognizing the force of the court decrees, some recommend this course until some compromise can be made with the bondholders. These persons claim that such a compromise is equitable because they believe that the "innocent purchasers" did not pay for the bonds more than 60 per cent. of their face value. The city was certainly a victim of misplaced confidence and the outcome of its struggle against the letter of its obligations and for the nearest approach to an equitable settlement will be watched with much interest.

A Public Convenience Station.

The Merchants' Association of San Francisco has prepared plans for a public convenience station adjacent to Union square, of which it will make a gift to the city. The plan is quite similar to the general plan proposed by the association last year, which was illustrated and described in Municipal Engineering, vol. xxii, p. 4. The larger cities are slowly awakening to the desirability of such provisions as this, but none of them have as yet provided as satisfactory structures as this one promises to be. We will present some account of its construction and operation when some experience in the latter and some figures of cost of maintenance have been gathered.

MUNICIPAL AND TECHNICAL LITERATURE

Books—Municipal Reports.

New Publications.

Calcareous Cements: Their nature and uses, with some observations upon cement testing. By Gilbert R. Redgrave, A. I. C. E. 238 pp. Cloth, $2.75 Net. J. B. Lippincott Company, Philadelphia, Pa.

English Portland cement is the main subject of this book and the history of the manufacture of this class of cement and the development of the processes are fully stated, including discussions of its composition, testing, chemical analysis and the composition of mortar and concrete. The manufacture and use of cement from special materials, such as slag, Scott's and selenitic cements and those made from sewage sludge and alkali works refuse are also quite fully treated. Cements made from plaster are also given some space, and the methods of manufacture of plaster, Keene's and Martin's cements and others are described. English specifications for Portland cement are given and the appendices give German specifications, tests of mortar and selenitic cement, specific gravity tests, and discussions of the effect of sea water on cement, the cost of manufacture and the Portland cement trade of the world. The rotary kiln process is described, but its important position in cement manufacture was not recognized at the time the book was written.

While the book is written almost entirely from the standpoint of the English manufacturer, its discussions of the various problems of cement composition and manufacture are very valuable and of general application, and the book contains many practical points not obtainable in any other book in the English language. It should be in the library miliar with the history, use and composition of cement, and it will be found a convenient reference book upon the sub- of every one who proposes to become fa- jects named in the list of its contents.

Plane Surveying. A text and reference book for the use of students in engineering and for engineers generally. By Paul C. Nugent, A. M., C. E., Associate Professor of Civil Engineering, Syracuse University. 577 pp. Cloth, $3.50. John Wiley & Sons, New York.

Professor Nugent's treatment of the subject of Plane Surveying does not differ materially from that of Professor Staley in his latest edition of Gillespie's Surveying. By reducing the number of examples and the space occupied by them, and by omitting the subjects of Geodetic Surveying and City Surveying, as well as some condensation in other chapters, the newer book is reduced to one volume. For class use this is doubtless an advantage, as most schools do not cover all the ground of Professor Staley's two volumes, but this is at the expense of completeness as a reference book for engineers generally. The books are so near alike in their general treatment of the subject that the choice between them will be largely a matter of personal preference, with less cost for the one book offset by fuller treatment and extension of field in the other.

Theory of Steel-Concrete Arches and of Vaulted Structures. By William Cain, M. Am. Soc. C. E. Second edition, thoroughly revised. 181 pp. Boards, 50 cents. D. Van Nostrand Company, New York.

The first edition of this book, No. 42 of the Van Nostrand Science Series, was issued some years ago under the title "Voussoir Arches," and has long been considered a standard discussion of the subject. The present volume contains the material of the first edition somewhat condensed and an equal amount of additional discussion applicable directly to the steel concrete arch. The formula developed does not differ greatly in form from that of Prof. Howe, but the application in the new book is made more directly to the new materials of construction than in the older books, prepared before the combination of concrete and steel had demonstrated its efficiency. This may be considered the first appearance in book form of a practical discussion of the principles of design of an arch in these materials, though some shorter developments of methods of computation have appeared in periodical literature, and it will meet the wants of many inquirers for authoritative statements of methods of application of the theory of arches to the new materials and of the forms which it is possible to give structures in which they are used. Opportunity to compare methods of computation in the several books on arches, under the conditions of concrete-steel construction, has not offered, but the method proposed in this book promises a minimum of labor and safe results.

Hendrick's Commercial Register of the United States for buyers and sellers. Especially devoted to the interests of the architectural, mechanical, engineering, contracting, electrical, railroad, iron, steel, mining, quarrying and kindred industries, for 1902. 128 pp. Cloth, $6. Samuel E. Hendricks Company, New York.

The twelfth annual edition has just appeared and shows the usual increase in size and scope and the improvement in accuracy, which seem to be the aim of the publishers. The following appears on the title page in addition to the title above and fully describes the contents and the intentions of the publishers: "A complete and reliable annual index of the above mentioned industries, containing over 300,000 names, addresses and business classifications, with full lists of the manufacturers of and dealers in everything employed in the manufacture of material, machinery and apparatus used in these vast industries, from the raw material to the manufactured article and from the producer to the consumer. Indispensable as a buyer's reference for the architect, engineer, contractor, manufacturer, jobber, retailer, purchasing agent and for mill, factory, mine and plantation; also for mailing purposes."

Familiarity with the book from frequent use for several years shows that the claims for the book are well founded and that it is surprisingly complete and free from errors in names and addresses.

Proceedings of the Boston Conference for Good City Government, and Eighth Annual Meeting of the National Municipal League, held at Boston, Mass., May 7, 8, 9, 1902. Clinton Rogers Woodruff, editor, National Municipal League, Philadelphia, Pa.

This cloth bound volume of 357 pages gives the papers presented at the conference and convention named, which consider the municipal situations in various cities of the country and discuss several problems of municipal improvement and embellishment. The cities discussed in

more or less detail are Harrisburg, New York, Pittsburg, Phildadelphia, Boston, Chicago, Cleveland, Baltimore and others. Copies of the report can be obtained from the editor, and are well worth sending for and reading with care.

Bulletin of the Department of Labor, September, 1902, Carroll D. Wright, Commissioner, Washington, D. C.

This issue contains the annual tables of statistics of cities collected by this department under the law, including population, area, police, saloons, arrests, fire department, vital statistics, parks, streets, sewers, street railways, sanitary inspections, garbage, lights, schools, libraries, charities, cost of public service plants, debts, assessments, receipts and expenditures, assets, etc. The report is growing from year to year as the methods of doing city business are discovered and this department should, from its experience, be the most ardent advocate of uniformity in accounting and reporting. Its collection of these statistics should in itself be an aid in this direction. Some extracts from the report will appear in later numbers of this magazine.

Water supply, considered principally from a sanitary standpoint. By William P. Mason, professor of chemistry, Rensselaer Polytechnic Institute. Third edition, rewritten, 454 pp. 62 illustrations. Cloth $4. New York: John Wiley & Sons.

The first edition of this book was reviewed at some length in Municipal Engineering, vol. xii, p. 48. This third edition is slightly reduced in size, and the price has been reduced one-fifth. The chapters on chemical and bacteriological examinations of water have been omitted, also the tables of typhoid fever statistics and the American Water Works association's memorial to congress. The changes in the text are not sufficient to show in the table of contents. Most of them are in the way of later statistics to keep the book up to date. None of the tables are exhaustive, and on this account are valuable mainly in a general way and not to the close student of the subject.

City Roads and Pavements Suited to Cities of Moderate Size. Second Edition, revised and enlarged. By William Pierson Judson, M. A. S. M. I., M. Am Soc. C. E., M. Inst. C. E. 195 pp. cloth. $2. Published by the author.

The first edition of this book was an essay on the subject applying its principles to a small city in New York. This edition omits the local features and reduces to their lowest terms the statements of information and opinion regarding street paving and paving material. Beginning with the preparation of the roadbed and the effect of ties and rollers thereon directly and through the road material above, the author continues with the descriptions of some old pavements in this country and elsewhere and of modern pavements. Tables of cost accompany this last chapter and it also contains tables of crowns desirable. Culverts, curbs, car tracks have their share of attention. The method of constructing the concrete base is briefly but completely described, including a set of simple cement tests which should be very satisfactory for acceptance of shipments of an approved cement.

Of the various kinds of pavements block stone is practically ruled out for the small city, except such as Medina, N. Y., and Kettle River, Minn. sandstone; wood pavements are approved: good brick for paving are carefully described, with various approved forms of construction· asphalt is placed at the head of the list, experience with it being well reported; bituminous macadam is very favorably considered and its method of construction is described; broken stone or macadam roads are fully considered from the description of acceptable materials to methods of maintenance. The only error the writer notices is a confusion regarding the Indianapolis wood pavements, which can be corrected by reference to back numbers of Municipal Engineering.

While all engineers of experience will not agree with some of the author's conclusions and methods, all will find the book very valuable as a source of information on good methods and materials, and on cost and durability of various kinds of pavement. The author has paid more attention than is usual to the subject of cost, and while many of the items will vary materially, many of the tables are so given that these variations can be taken account of. The need of a book of this kind has been felt for some time and the appearance of this volume epitomizing the practice in this class of work at a low price is timely. A large sale is prophesied. The many illustrations, the handsome paper, type and binding add their share to the attractiveness of the volume. The good words of the first readers of the book among the road building experts must be very acceptable to the author.

Practical calculation of Dynamo-Electric Machines. A manual for electrical and mechanical engineers and a text-book for students of electrical engineering. Continuous current machinery. By Alfred E. Wiener, E. E., M. A. I. E. E. Second edition, revised and enlarged. 727 pp. cloth, $3. Electrical World and Engineer, New York.

That this book is practical is apparent on a general examination, and it is very full, containing data and directions for the design of nearly every form and type

of dynamo-electric machine ever put on the market. It still properly contains some which are obsolete, and is as near up-to-date with the new forms as it is possible to keep a book, the appearance of new editions of which depends on the rapidity of its sale. That the book meets the needs of electrical and mechanical engineers and students is shown by the fact that the second edition is called for in less than five years after the first, and the editions cannot be small to pay the heavy expense of getting up the book in the excellent style in which it is printed and illustrated.

Part I discusses the physical principles of dynamo-electric machines, of current generation in the armature and the magnetic field. Part II gives the methods of calculating the armature, including winding, core, energy losses, commutators, brushes, current conveying parts, etc., to pulley and belt. Part III shows how to calculate magnetic flux, useful and total, leakage factor as dependent on machine dimensions and as obtained from tests. Part IV calculates the field-magnet frame, giving forms and general construction rules. Part V calculates the magnetizing force, including the theory of the magnetic circuit. Part VI shows how to calculate the various magnet windings, coil, series, shunt, and compound. Part VII shows the efficiencies of generators and motors, methods of designing dynamos of same type, motors, dynamotors, unipolar dynamos, with application of graphics to dynamo design. Part VII gives a number of examples of calculations for electric generators, leakage factors, and motors. The appendices give tables of dimensions of modern dynamos, wire tables and winding data and instructions for locating and remedying troubles with dynamos in operation.

While actual practice is a very important factor in successful design of any kind, it is apparent that the author's statement that any one possessing a knowledge of arithmetic and algebra can successfully calculate and design any continuous-current dynamo by the use of this book is very nearly true, the degree of his success depending in addition only upon the character of the experience he accumulates in the course of his work. The simplicity of the explanations and the formulae, the completeness of the tables and the fullness of the examples given make the work easy to understand by any one having a knowledge of the principles of electricity, and it should be of great value to any one desiring to understand the principles of the design of electric machinery and its selection for given work, whether he is called upon to make the actual designs or not. The price of the book is one of its attractions and possibly adds a little to its popularity.

Diagrams of Mean Velocity of Uniform Motion of Water in Open Channels; based on the formula of Ganguillet and Kutter. Prepared by Irving P. Church, C. E. Professor of Applied Mechanics and Hydraulics, Cornell University. $1.50. John Wiley & Sons., New York.

A series of diagrams for obtaining one of the three unknown quantities, C. R. and S, in the formula for the velocity of flow of water in channels when the other two are known, using the well-known Kutter form of equation. They take the place of the large diagram in the American translation of his book, showing the deviation of the formula. The tables are made with values of N from 0.009 to 0.035, and should be very convenient for making close computations and comparing results with various values of N, the coefficient of roughness. The values of S are given for points between 0.01 and 100 per 1,000, of V between 0.1 and 40, and of R between 0.1 and 25. The values of R gives in the explanation of diagrams for sewers might well have been extended beyond those for 4-inch to 12-inch pipes

The Municipal Year Book for 1902, giving the population, assessed valuation, principal officials and ownership of public utilities; also information regarding the water supply, sewerage, street cleaning, street sprinkling, garbage, fire and underground electric service in all incorporated places in the United States and in all New England towns of 3,000 population and upward by the census of 1900; with summaries and editorial discussion. Edited by M. N. Baker, Ph. B., C. E. 364 pp. Cloth, $3. Engineering News Publishing Company, New York.

The description of the book from the title page gives fully its aims, and the statement that the book shows the usual care and attention to detail of its editor is sufficient to show that the work is well done. The introduction gives lists of towns without water works, electric lights and telephones; the methods of water purification in use in each town reporting any; those having sewage purification systems; a list of water pollution suits; garbage reduction and disposal plants in operation; central heating stations, data regarding municipal and private ownership of public utilities, and private operation of sewerage systems; all summaries from the data given under the headings of the various cities in the lists occupying the 310 pages of the book proper. The book is said to be brought down to the date of issue, and gives names of

a number of officers of city departments and public service corporations. It is apparently quite accurate, but there are some errors in names of officials, and such tables as that showing private operation of sewer systems show the impossibility of securing returns which are perfect, on account of the proneness of the average city official to misunderstand a question a little out of his regular routine of work. The book will be valuable to many having business with the industries and departments mentioned as well as to students of municipal affairs.

Municipal Reports.

Annual Report of City Electrician of Galesburg, Ill. George Messplay, City Electrician.

The city of Galesburg only recently began the operation of its street lighting plant. The report of the year ending March 31, 1902, shows a full year's operations. Salaries amounted to $2,297, fuel to $2,804 and supplies, repairs and insurance made up a total of $5,692 cost for the year. For the first six months, with 203 lamps, the cost was $13.56 per lamp, and for the second six months, with 218 lamps, it was $13.03, making the total for the year $26.59, approximately. Adding interest on $40,000 bonds for cost of plant at 4 per cent., $2,000 for sinking fund and $2,000 for depreciation, the total cost of light for the year is $11,292, which, for 218 lamps, would make the cost $51.79 per lamp per year. The average number of lamps in use for the year is between 203 and 218, so that this figure should be increased about $2 to be quite accurate. Additions were made to the plant for sixteen lamps, etc., costing $1,759. The works were in operation 2,272 hours during the year. The electric light department was charged $2,804 for power from the water department, as stated above. A test run showed 825 pounds of coal used per hour. If it is assumed that 1,000 pounds per hour is used and 300 pounds a day for banking fires, the cost of coal at $1.70 a ton would be $2,024, showing an overcharge of $780. Some overcharge is correct as the electric light plant should pay its share of the depreciation in boiler plant in addition to the cost of coal.

Semi-annual report of the Water and Light Commissioners of Duluth, Minn., ending July 1, 1902. L. N. Case, manager.

The first six months of the year has usually shown a loss in operation, though the entire year showed a surplus of $6,234 in the half year. Compared with the same period in 1901 the increase in cost of operation and maintenance was $3,372 and the increase in receipts was $10,305, although the gas rates were reduced ten cents per 1,000 feet in January. The rates for gas will again be reduced next January by fifteen cents, making the rate $1.00 per 1,000. There has been an increase of receipts from water, indicating that for the year the excess over 1901 will be $14,000, and Mr. Case recommends another reduction in water rates to private consumers. Reduction in hydrant rental is not recommended as the city now pays only $26,000 for that service, and $11,305 is received from a tax levy. The interest charge is $113,600. A statement in Municipal Engineering Magazine to the effect that interest on bonded debt of municipal water works about offsets hydrant rentals is quoted to indicate the low rate at which the city is obtaining its fire protection. This statement is hardly applicable to the first years of a water system alone, when the interest on practically the entire cost of the works must be paid, but, unless a system is exceptionally expensive, it will be very nearly true of the average of a number of years. In the commissioners' report it is shown that the private consumers have borne the burden of interest on construction and the cost of construction itself in very large part and that they are entitled to the first relief in reduction of rates.

The careful separation of accounts of water and light and the possibility of making each responsible for its own business is a noteworthy feature of the bookkeeping system in use.

Annual reports of the City of Ft. Wayne Ind., for 1901. Henry C. Berghoff, mayor, August M. Schmidt, clerk.

This is a volume of 506 pages which goes into the detail of individual expenditures in the fashion common in the reports of small towns, and the printer has been permitted to use as large type, as many leads and as many blank pages as he pleased, so that it is not easy to get at all the facts, especially in the financial statements.

The city is under the system making the boards in charge of the various city departments the appointees of the mayor and responsible to him. The city owns its water works plant and has a fund of nearly $25,000 available toward the purchase of an electric light plant when it is decided upon. The garbage crematory is also operated by the city. During the year covered by the report, the cost of fuel per ton of garbage cremated was 25¼ cents, the cost of collection was 66.34 cents, the cost of attendants at the crematory was 24.08 cents, making a total for collection and disposal not including interest depreciation and repairs of $1.04½ per ton.

Annual report of the board of water commissioners of Kingston, N. Y., for year ending Feb. 28, 1902. 62 pp. paper. O. C. Longyear, Supt.

The commission has issued a handsomely illustrated history of the works and description of the present property, which consists of a number of reservoirs on mountain brooks and a 4,000,000-gallon pressure filter plant. The supply being by gravity the commissioners have put in two Venturi meters so that they are able to measure the consumption. The commission has learned the necessity of knowing the condition of the water consumption from past difficulty in keeping up the supply and is now able to tell whether a threatened shortage is from waste or lack of sufficient supply. The daily average supply is 3,076,830 gallons or 123 gallons per capita. The filtration cost $1,111.88 using 116-1000 grain of sulphate of alumina per gallon. There is now no question of sufficiency of supply.

Annual Report of the Controller of the City of Detroit of the Receipts and Expenditures of the Corporation for the Fiscal Year Ending June 30, 1902. Francis A. Blades, Controller.

A book of 340 pages devoted to the finances of the city of Detroit should certainly give all the information required and this book seems to do so. It is thoroughly classified and gives all required details. After a list of officers present and past comes the analysis of receipts and disbursements, showing the sources of the former and the funds to which each class of receipts was distributed, and the latter in full. Then come statements of the receipts and disbursements for each individual fund, statements of the public debt and sinking funds for each purpose and the corporate wealth or account of stocks. Comparisons with series of years follow, and statements of real estate of city, county, or others exempt from taxation, and leases. The last part gives the detailed estimates of the various city departments for 1902, the appropriations made and the assessed valuation, tax levy and rate.

The receipts for the year of the report were $5,822,819 and the disbursements, $5,807,753. The total net debt of the city, after deducting sinking fund on hand is $3,938,736, an increase of $15,476 during the year and $1,000,000 within the limit. This does not include the net water debt of $934,920, which is not subject to the 2 per cent. limit of indebtedness. The assessed valuation is $249,503,720, nearly one-quarter of which is personal property, and the tax rate of 17.29 mills.

The report will well repay study, and while it is not summarized in the form proposed by the National Municipal League, it should not be difficult for one versed in accounts to make the statement in that form. For purposes of comparison with other cities this is desirable, but for the purposes of the city of Detroit this report is probably entirely satisfactory.

Twenty-First Annual Report of the Board of Health of the City of Detroit for the fiscal year ending June 30, 1902. Guy L. Kiefer, Health Officer.

This board has a full force, including a sanitary engineer, a chemist and bacteriologist, registrar, medical, food and milk, meat, quarantine, funeral, plumbing and garbage inspectors, disinfectors, guards and clerks. There is also a board of examiners of plumbers. The report gives general statements of the contagious diseases in the city and discusses the subjects of milk supply, garbage, alley paving, smoke, need of public baths and lavatories, etc. The receipts and expenditures were $41,646, about three-fourths being for salaries and labor. The special investigation of the year by the engineer and the bacteriologist was into the ventilation of schools and a large table of results is given. Excellent results are shown in the newer schools, the principal lack being of moisture in the air. The garbage inspector complains that not over 25 per cent. of the homes have the garbage cans required by ordinance and wants the law enforced, very properly.

Fifteenth Annual Statement of the Board of Directors of the Street and Sewer Department of Wilmington, Del., for the year ending Jan. 31, 1902. Harvey J. Wiley, Secy.; T. Chalkley Hatton, Engineer.

As usual with Wilmington's reports, this one is in the best style of the printers' art. Nearly $41,000 was spent on extension and maintenance of sewers and nearly $16,000 on pavements, most of it on brick and macadam, in all about one and one-quarter miles in length. The sewer department has laid 20,376 feet of sewer, nearly half of which was ten-inch pipe. One sewer requires pumping and a Shone ejector was put in at a cost of $2,900. Electric power is to be used for compressing air at a cost of 5.6 cents per kilowatt, furnished at cost by one of the factories specially benefited by the sewer.

Municipal Manual for the city of Altoona, Pa., for the fiscal year 1902-3. W. J. Hamor, City Clerk.

A little book, 2¾ by 4½ inches, contains all the essentials of the city's operations, including city hall directory, council regulations, appropriations and salaries, estimated revenues, summaries from the controller's report of the city's finances, and from the water department's report, water rates, police, fire and sewer department statistics, and regulations, mode of

procedure in making improvements, election, school, street railway and other miscellaneous information. As a convenient pocket book of reference this is a success, but it does not take the place of detailed reports of the city's administration.

Annual Report of the City Engineer of Toronto, Ont., for 1901. C. H. Rust, City Engineer.

The city engineer of Toronto, Ont., has charge of streets, sewers and water works, including the supervision of the street railway and electric lines. Garbage destruction has been transferred to the street commissioner in the department. About 15½ miles of street were paved in 1901, of which 4.5 were asphalt, 2.7 cheap cedar block, 2.7 macadam and 4.5 brick. Over 17 miles of cement walks were laid and about ½ mile of brick walk. Seventy per cent. of the 260 miles of streets are paved, 24 with cedar block, 14 with asphalt and 10 per cent. with macadam. It is the custom for the city engineer to bid upon contracts, and if his bid is the lowest the city performs the work under the city engineer's supervision by day's labor. Of five contracts thus completed during the year three cost slightly more than the city engineer's tender, but all cost less than the next lowest bid, in all saving $1,730, to which should be added the cost of inspectors which was also saved. Asphalt repairs are done under contract at $1.23 a square yard for 2½-inch surfacing, $1.09 for 2-inch and $4.75 a cubic yard for concrete foundation.

Nearly 8,000 feet of pipe sewer was laid during the year, increasing the total length to 233½ miles.

The street railway system is operated by a company under lease from the city. Since 1892 the gross earnings have increased from about $800,000 to nearly $1,700,000, the trackage from 70 to 86 miles and the payments to the city by the company from about $65,000 to about $157,000. The company builds and repairs the tracks and pavements.

Cost of garbage and ashes removal is not given; 147,154 loads were hauled. Machine street sweeping cost $39,011 for 1,515 miles cleaned once, from which 36,099 loads were removed. The patrol system for business streets between May 6 and Nov. 30 cost $20,631.70. There were 87 "beats," varying in length from about 800 feet to 2,000 feet or more. Three trolley street sprinklers used 10,710 loads of water, 28,910,000 gallons, to cover 18,744 miles at a cost of $3,046 or 16¼ cents a mile. The sprinklers have capacities of 2,500 to 2,800 gallons. The 500 gallon sprinkling carts used 73,882 loads, 36,928,500 gallons of water, the cost not being stated.

The control of the revenue of the water department is not in the city engineer's department. There seems to be a deficit. Maintenance cost $138,624.87, and new construction $10,399.29, other expenses about $37,000, interest and sinking fund of debt $222,749, while the city treasurer reports receipts as $330,444.56. About 8,000 feet of mains were laid during the year and 1,033 services. The consumption per capita is about 100 gallons per capita per day, 22,468,831 gallons total per day, pumped at a cost of 4.75 cents per 1,000 gallons, against an average pressure of about 93 pounds.

CEMENT AND CONCRETE.

Arch—Amphitheater.

A Novel Use of Cement.

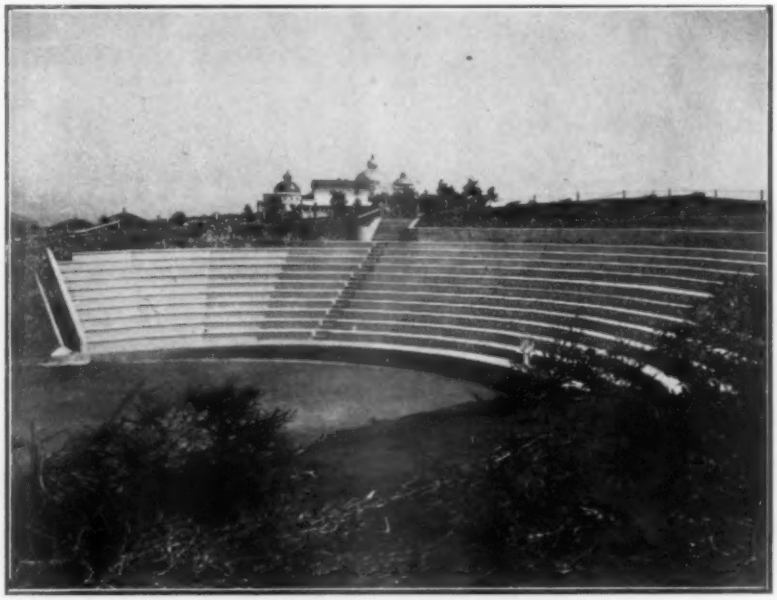
The buildings of the establishment of the Theosophical society at Point Loma, Cal., of recent newspaper notoriety, are faced with Portland cement stucco, for which the climate of the locality seems to be particularly favorable. One of the unique uses of cement is for the construction of the outdoor amphitheater, a view of which is shown in the accompanying half-tone. We are indebted to Mr. E. Duryee of Colton, Cal., for the photograph and for the following description of the method of construction of amphitheater and faces of buildings, which may be suggestive of similar uses elsewhere.

The amphitheater does not mar the landscape and on this account is suggestive of a possible improvement in those athletic parks where the contour of the ground makes possible the substitution of this style of construction in place of the unsightly and often dangerous grand stands that make impossible any attempt at landscape gardening or beautifying of the grounds. The outline of the amphitheater is circular with a radius of sev-

enty-five feet to the inner arc. There are twelve terraces nine inches high by thirty inches wide. After the terraces had been excavated the forms for the concrete of the lower curb were staked in place. Ordinary one inch boards were held in position by stakes, as is usual in building curbs. These concrete risers were made four inches thick of concrete and the treads three inches of concrete. The proportions were one of cement to nine of gravel, or supposed to be one of cement, three of sand and six of pebbles. The forms for the curb were the hight of the finished tread, and the concrete for the tread was deposited and rammed at the same time to the curb. Before the concrete had set a mortar of the proportions of one of cement to two of sand was floated with a straight edge on the tread to a thickness of half an inch and trowelled to a smooth surface. After the form was removed from this section a like mortar was plastered on the face of the riser and trowelled to a smooth finish. There is no trouble from frosts in this locality, so it was not necessary to provide foundations of cinders or rock, and the only precaution taken to prevent settling was to ram the earth before depositing concrete and to moisten it well to prevent the concrete drying out too quickly. The benches were built of lumber in place, the space beneath the seats in front and behind was cased in and the whole was painted the color of the concrete. The benches are eighteen inches high and twelve wide.

The exterior of the building is faced with two coats of plaster on wood lath. The first coat is ordinary lime mortar with fiber in it. The mortar for the second coat is of the proportions of one cement to three sand and one-half part lime putty. In plastering exteriors it is essential that the cement used be well cured and that the lime paste have been completely slaked. To insure this it should have been slaked and put through a screen a fortnight before using, and, if possible, to secure it, a lime free from magnesia should be used.

The columns extending around the building are built with wood post centers and wire lathing covering with the two coats of plaster on the exterior. The capitals are cast concrete and are very effective. The flights of stairs are all in concrete. The roofs are all tar and gravel flats except for the domes.



A NOVEL CONCRETE STRUCTURE.

A Small Concrete Arch.

There is beginning to be quite a demand for small culverts or arches made of concrete. One such, constructed by J. H. Burnham of Bloomington, Ill., for the commissioners of highways of Bloomington township, is illustrated in this article.

The culvert was 24 feet long with an opening or waterway of 7 feet. The bases were built up two feet high with a thick-

ness of two feet. The walls were then carried up two feet more, but decreasing in thickness to 18 inches. At this hight the arches were turned in the usual manner and the thickness of the arches was gradually reduced to 10 inches at the top.

The wings were made 8 feet long at the bottom and were built up square to the hight of 8 feet then sloped upward to meet the base of the parapet walls. They were 18 inches thick at the bottom and one foot at top.

The parapet walls were ten inches thick at the top and were built up two feet above the top of the arch. Galvanized iron hand railings were placed on these parapets.

The concrete was made of Alsen-German Portland cement one part, sand two parts, and crushed Kankakee limestone five parts. It was mixed by hand and placed in the forms in the usual manner. The face walls were all plastered while the concrete was fresh enough for it to adhere and become a part of the mass.

All work was carefully done of the best of materials and appears to be strictly first-class in every respect.

The forms used were made of lagging 2 by 4 inches supported on semi-circular frames, one at each end for an 18-foot culvert and an additional frame in the center for a 24-foot culvert. The forms for the wings were built of 2 by 8-inch planks. The foundation was laid three feet below the surface and the first foot in depth was built of concrete rammed into the trench, forms being used from this line to the top.

The process seems to be a simple one, but experience is necessary to insure proper handling of the material obtainable and to have a well-finished surface and durable structure.

A CONCRETE CULVERT.

ORGANIZATIONS AND INDIVIDUALS

Technical Meetings—Personal Notes.

Technical Meetings.

At a library meeting of the Brooklyn Engineers' Club, Nov. 6, B S. Dunn talked on "The Manufacture of Portland Cement." The annual meeting of the club will be held Dec. 11 when officers for the coming year will be elected.

The Engineers' Club of Philadelphia held a meeting Nov. 15. J. E. Codman presented a paper on "Philadelphia's High-Pressure Fire Service." The club will celebrate its twenty-fifth anniversary Dec. 6 by giving a banquet at the Union League Club.

The Kentucky Independent Telephone Association and the Southern Indiana Independent Telephone Association met in joint session in Louisville, Ky., Nov. 5. Among the papers presented were the following: "Long Distance Toll Lines and Connections," H. K. Cole, vice-president Kentucky Independent Telephone Association, Owensboro, Ky.; "The Bell Peo-

ple as Antagonists," A. J. Payton, Rockport, Ind.; "Franchises," John R. Allen, Lexington, Ky.; "Rates," D. L. Pendleton, Winchester, Ky.; "Interstate Association," E. M. Coleman, Louisville, Ky.; "Merging of Independent Telephone Plants," J. S. Brailey, Toledo, O.; "Operating and Governing Telephone Plants," A. L. Tetu, Louisville, Ky.; "Our Relation Toward the National Association," G. A. Keinle, president Southern Indiana Independent Telephone Association.

The twenty-third annual convention of the Indiana Engineering Society will be held at Indianapolis Jan. 15-17, 1903.

The third annual convention of the Wisconsin Clay Workers' Association will be held at Green Bay, Wis., Jan. 27 to 29, 1903.

The Iowa Brick, Tile and Drainage Association will hold its twenty-third annual convention at Ames, Ia., Jan. 21 and 22, 1903.

The twenty-fifth annual convention of the Illinois Clay Workers' Association will be held at Bloomington, Ill., Jan. 6 and 7, 1903.

The seventeenth annual convention of the National Brick Manufacturers' Association will be held at Boston, Mass., Feb. 4 to 7, 1903.

The annual meeting of the electrical committee of the Underwriters' National Electric Association will be held in New York City Dec. 9.

The second annual Minnesota Sanitary conference will be held at St. Paul Dec. 17 and 18. Water supply and tuberculosis will be the principal topics discussed.

The annual convention of the Michigan Engineering Society will be held at Battle Creek, Mich., Jan. 20, 21 and 22, 1903. Officers for the coming year were elected at the recent annual meeting of the board of directors as follows: President, Prof. M. E. Cooley, Ann Arbor; vice-president, A. L. Holmes, Grand Rapids; secretary and treasurer (re-elected), F. Hodgman, Climax.

The nominating committee of the New England Water Works Association has presented its nominees for officers next year as follows: For president, Mr. C. K. Walker of Manchester, N. H.; for vice-presidents, Messrs. V. C. Hastings, G. P. Westcott, E. C. Brooks, E. W. Kent, H. N. Turner, J. C. Hammond, jr.; for secretary, Mr. W. Kent, Narragansett Pier, R. I.; for treasurer, Mr. L. M. Bancroft, Reading, Mass.; for editor, Mr. C. W. Sherman, Boston, Mass. These names will be balloted on at the annual meeting in January.

The annual meeting of the American Society of Mechanical Engineers will be held in New York Dec. 2 to 5. The program includes the following papers: "Heat Resistance, the Reciprocal of Heat Conductivity," William Kent; "The Metric System," F. A. Halsey; "A Rational Solution of the Problem of Weights and Measures," S. A. Reeve; "Tests of a 12 H. P. Gas Engine," C. H. Robertson; "Deflection of Beams by Graphics," W. Trinks; "Entropy Analysis of the Commercial Value of Water Power," A. F. Nagle; "Finer Screw Threads," C. T. Porter; "Flywheel Capacity for Engine-Driven Alternators," W. I. Slichter; "Rotary Pumps," J. T. Wilkin; "Continuous Record of Engine Governor," J. C. Riley; "Centrifugal Machines and Their Uses," B. Viola; "A New Oil Testing Machine," A. Kingsbury.

Personal Notes.

Jesse Smith has been elected alderman at Atlanta, Ill.

Henry Holt Hines has been elected village clerk at Carlyle, Ill.

E. G. Barrow has been elected city engineer at Hamilton, Ont.

Mayor W. F. Robertson has been elected city surveyor at Wilmington, N. C.

Alfred B. Smith was elected mayor, Nov. 4, of Brigantine, N. J.

Oglesby Paul has been appointed landscape gardner of Fairmount Park, Philadelphia.

Albert Raymond of Raymond Bros. Impact Pulverizer Company, Chicago, Ill., died Nov. 16.

Simeon James Dawson, a prominent Canadian engineer, died suddenly in Ottawa, Ont., Oct. 30.

Francis J. Power, superintendent of the Alexandria Water Works Company, Alexandria, Va., died Nov. 11 of paralysis.

Schuyler Hazard, M. Am. Soc. C. E., has been appointed chief engineer of the Catawba Power Company, Rock Hill, S. C.

William Forsythe, former surveyor of the District of Columbia, died at his home in Washington, D. C., Nov. 5, aged 82 years.

Albert A. Graves has been elected mayor, William F. Wagensell city clerk and James Stuart treasurer at Port Huron, Mich.

C. Wuestenfeld has resigned as manager of the Elgin, Aurora & Southern Traction Company's electric light plant at Elgin, Ill.

Lieut.-Gen. Sir John Stokes, senior vice-president of the Suez Canal Company, died at his home at Ewell, Surrey, England, Nov. 17.

Magnus L. Werrell has been appointed superintendent of the Selma Water Company, Selma, Ala., to succeed H. A. Haralson, resigned.

Julius F. Munckwitz, supervising architect and superintendent of parks, New York City from 1871 to 1884, died Nov. 10, aged seventy-one years.

Arthur J. Cox, who is associated with Charles P. Chase in the Iowa Engineering Company, Clinton, Ia., has returned from Europe, where, for fourteen months he has been investigating sewerage and sewage disposal systems in England, France and Germany.

Charles Moehlman, foreman of the iron foundry of the General Electric Company, Schenectady N. Y., died suddenly at his home in that city Oct. 31.

Professor Sidney Howe Short, one of the pioneers in the construction of electric railways, is dead in London from appendicitis. He was a native of Ohio.

J. J. Bellman and Henry Sanford have established offices at 14 Church-st., New York City, where they will conduct a general engineering and contracting business.

Edward Nelson has been appointed general inspector of concrete of the New York Central & Hudson River Railroad, to succeed H. Latimer, who has been transferred.

George R. Webb, Baltimore, Md., has retired as a director of the United Electric Light and Power Company, and will probably give his attention to the electric lighting business.

Benjamin H. Flinn, Jun. Am. Soc. C. E., engineer of the Ohio State board of health, has been placed in charge of the hydrographic work of Ohio, of the United States Geological survey.

W. A. H. Bogardus, Brooklyn, N. Y., died at Greenwich, Conn., Nov. 7, aged forty-four years. Mr. Bogardus has, at various times, been prominently connected with street railway matters.

Albert E. Lang has resigned as president of the Toledo Railway & Light Company, Toledo, O., to become chairman of the board. Henry A. Everett of Cleveland succeeds him as president.

The Burlington Construction Company, Berlin, Conn., has established an office in the Board of Trade building, 131 State-st. Boston, with H. C. Collins, contracting engineer, in charge.

O. L. Ingalls, M. Am. Soc. C. E., will tender his resignation as inspector of plumbing of the District of Columbia to become engineer in charge of the water works and sewers in the city of Manila, P. I.

Prof. Jacob Gould Schurman, president of Cornell Univ., has been selected to act as the Dean of the College of Civil Engineering, Cornell University, caused by the resignation of Prof. E. A. Fuertes.

Roger B. Williams, jr., Jun. Am. Soc. C. E., and Ezra B. Whitman have formed a partnership as Williams & Whitman and will practice civil and sanitary engineering, with an office in the Fuller building, New York City.

J. D. Flack has resigned as engineer for the International Lithoid Company to accept a position as erecting engineer and superintendent with the A. D. Granger Company, constructing engineers, 95 Liberty-st., New York City.

E. A. Lee, C. E., has resigned his position in the Denver office of the American Bridge Company and formed a partnership with N. C. Bonnevie, M. E., under the firm name of Bonnevie & Lee, with offices in the Jacobson building, Denver. They will practice general engineering.

William P. Gerhard, consulting engineer, New York City, delivered a lecture before the school of engineering students of the Massachusetts Institute of Technology Nov. 1 on "The Sanitary Engineering Work of Large Modern Buildings."

A. Freihoff and J. L. Wieland have purchased the business of the late A. M. Patitz and will practice mechanical and electrical engineering under the firm name of Freihoff & Wieland, with offices in the Germania building, Milwaukee, Wis.

L. E. Chapin, M. Am. Soc. C. E., Central Savings Bank, Canton, O., and Morris Knowles, Assoc. M. Am. C. E. 1017 Frick Bldg., Pittsburg, have formed a copartnership for the practice of general and consulting engineering. Mr. Chapin will be in charge of the Canton office and Mr. Knowles in charge of the Pittsburg office.

Mayor Low of New York City has appointed a commission to pass on the relative merits of the original and Commissioner Lindenthal's revised plan for the Blackwell's Island Bridge as follows: Prof. William H. Burr of Columbia college; Prof. Palmer C. Ricketts of Troy Polytechnic Institute; Henry W. Hodge of Baller & Hodge, New York City.

Burton J. Ashley, M. Am. Soc. C. E., civil and consulting engineer, has resigned as city engineer of Zion City, Ill., and returned to Chicago, where he will resume his private practice. Mr. Ashley has been associated in the founding of Zion City from its beginning. The city has an estimated population of 8,000 and has been entirely built since August, 1901.

Prof. E. A. Fuertes, M. Am. Soc. C. E., has resigned as director and dean of faculty, College of Civil Engineers of Cornell university, on account of ill health. He will become professor of astronomy, in charge of the Gen. A. C. Barnes observatory. Prof. Fuertes was formerly chief engineer of the Croton Aqueduct and for three years was consulting engineer to the city of New York.

Mr. Arthur J. Cox of the Clinton, Ia., Engineering Company has recently returned from a trip to Europe, where he made a special investigation of the sewerage and sewage disposal systems of France, Germany and England. He also attended the British Sanitary Congress, in session at Manchester, obtaining the latest developments in this work, including the Royal Sewerage commission's investigation in England.

W. E. Baker and S. S. Neff have formed a partnership under the firm name of W. E. Baker & Co., engineers, with offices at 170 Broadway New York City. Mr. Baker was formerly electrical engineer of the Metropolitan Elevated Railway, Chicago, and general superintendent of the Manhattan Railway, in which capacity he had charge of the conversion of the New York elevated railways from steam to electric traction. Mr. Neff was formerly superintendent of the Chicago elevated loop, and later of the Boston elevated railway.

MACHINERY AND TRADE

A Coal Dust Burning System.

The C. O. Bartlett & Snow Company of Cleveland, O., has perfected and put into practical operation a system for burning soft coal which is believed to secure: 1st.—A perfect combustion; in other words this means—there is no black smoke. 2d—A saving of 25 per cent. in the amount of coal used. 3rd—No cinders and scarcely any ashes. 4th—It requires no change in the grates used under any ordinary boiler to install this system, and in case of accident coal can be fed at the furnace doors the same as before. 5th—The supply of feed can be changed at a minute's notice by simply turning a hand wheel. 6th—The doors are not opened at all, thus doing away with all undue contraction and expansion caused by the admission of cold air through the furnace doors as in the old way of firing. 7th—No fireman is required.

To get perfect combustion three things are absolutely necessary. The coal must be of uniform size—in other words, it is utterly impossible to get the same results from burning a chunk of coal as big as a man's head and another piece as big as a pea. The coal must be of equal moisture. Run of mine coal containing 5 to 6 per cent. moisture will not give the same combustion as slack coal containing 10 to 12 per cent. moisture. Powdered coal must be burnt in suspension. If it is swept or pushed into the furnace the heavy particles will fall to the bottom and become a solid clinker which is very objectionable and almost impossible to get out.

In the Rowe and Bender Fuel Feeder and Regulator the cheapest kind of slack coal is used, dried down to 2 per cent. moisture, then ground to 80 mesh. The ground coal is stored in an iron storage hopper or tank above or near the boiler. An air pipe is connected with feeder spout at the furnace, and above the boiler in the breeching or stack a blower fan is attached to this pipe of sufficient size to furnish the necessary air for burning the coal dust. The operation is as follows:

The coal is conveyed by a special conveyor from the bottom of the storage bin to a spout. The speed of this conveyor controls the amount of coal used and can be changed at a moment's notice by turning a hand wheel to feed faster or slower according to the amount of fuel desired. From the conveyor by the spout the coal is fed direct to the air spout, which has a nozzle on the inside which concentrates the air just as it strikes the coal as it comes down from the conveyor. This gives a thorough mixture of the coal with the air and at the same time prevents any danger of clogging. The coal is caught by the current of air and blown along the air spout to the furnace spout. Just before entering this spout there is another nozzle which again concentrates and mixes the air with the dust just before it enters the feed spout. This feed spout is made of cast iron and has a semi-circular opening, or mouth, so as to spray the coal dust up and against the arch wall, where it is ignited and burned in suspension. This spout is covered with fire brick for protection and the current of air continually passing through it also protects it from burning out. There are slides or valves on the different places in the air pipe so as to admit just enough air to get perfect combustion, all of which are under the complete control of the operator.

Injunction Asked Restraining Unauthorized Use of Warren's Bituminous Macadam.

The United States circuit court has been asked to issue a permanent injunction to restrain the city of Muskegon, Mich., from using certain improvements in pavements not used in this country before the issuance of patent 675,430 and asking for damages. The suit is brought by Warren Brothers Company, the owners of the patent, which is the first one issued for bituminous macadam pavement, and may prove to be expensive. Some of the principles stated in this patent were entirely new as applied to pavements, so far as this magazine has been able to ascertain, and the company is judicious in deciding to obtain the decision of the court upon them. They own several other patents which will be strengthened by favorable decision upon this one. But one suit has been entered and it will doubtless be pushed to a decision as rapidly as possible.

H. S. Palmer's Method of Concrete Building.

About eleven years ago Mr. Harmon S. Palmer, a practical user of cement, devised a method of building with hollow concrete blocks, his first idea being to cheapen the construction at the same time retaining more strength than is developed in the brick wall which his system displaces. He found that an important factor in the scheme is a machine which will produce geometrically correct blocks and designs adapted to the requirements of the architects so that cutting and fitting will be unnecessary. After several years of experimenting a practicable machine was devised and patented, and now almost any desired form of solid or hollow block, can be made by means of the machine with its removable molds, bottom and cores. The system practically does away with the framing square for the most intricate designs of the architect as well as the plainest structures on account of the accurate form of blocks.

The advantages of the hollow flues in walls, which are produced by the regular setting of the geometrical blocks are well known, producing as they do the best ventilation, protection from cold and dampness, facilities for placing pipes and wires and a non-absorbent backing for plaster and decorations.

Mr. Palmer's first machine was patented in 1899 and he has patents also on the forms of blocks he has devised and upon the walls constructed of these blocks in which he seems to have provided for every possible need or desire of the architect or owner.

A computation from actual observation of the operation of a machine and the materials used substantiates the claim that the blocks can be turned out at a price which makes competition with brick possible, without taking into account the better appearance, the greater strength, durability, convenience and sanitary qualities.

In brief the advantages claimed for the concrete blocks are saving in cost of construction; more handsome appearance; fire and frost-proof walls; less insurance rate; warmth of building in winter and coolness in summer; freedom from attack and harboring of rats and other vermin; less foundation on account of lighter walls for same strength; saving of time and mortar in laying; durability; saving of galvanized iron, special terra cotta or cut stone ornamentation, all being replaced by the forms of concrete block; ease of attachment of beams and joists to walls; saving of brick backing and of furring for plastering, the block surface taking the plaster directly, if desired; dryness of wall; facilities for inserting pipes, wires, speaking tubes, ventilators, etc.; cheapness, in which it is unsurpassed; and strength.

Our illustration shows a handsome building erected in Springfield, Ill., by Vance & Lawson who control the Palmer system of hollow concrete building construction in that city. Many similar residence buildings have been constructed elsewhere, and several large manufacturing corporations have used the blocks for office, factory and warehouse buildings, for all of which they prove eminently suitable, in strength, durability, appearance and low cost. The Oklahoma City Stone Manufacturing Company has just completed a large four-story building for the Armour Packing Company and has ordered two car loads of the machines shipped for its future work.

The blocks and the system of construction have been thoroughly tested under all sorts of conditions since Mr. Palmer began his experiments and there are many buildings in existence which prove his claims. He now presents a perfected block and system of construction and a perfected machine for making them cheaply and has just organized the Harmon S. Palmer Hollow Concrete Building Block Company of Washington, D. C., to extend the use of the system throughout the world. Little capital is required to carry on the business in a locality as no expensive building or plant is necessary, the most satisfactory procedure often being to take the machines to the source of sand or gravel or to the site of the building, thus saving one stage of transportation. The company will send its literature and enter into further detail with any one in or proposing to enter the field of cement construction, which is certainly that in which the most rapid development is under way. The twentieth century bids fair to be known as the "Cement Age."

W. W. Benson, 803-9 Drexel Building, Philadelphia, Pa., is a general agent of the H. S. Palmer Hollow Concrete Building Block Company.

Crushed Quartz for Granitoid Walks.

An excellent material for granitoid walks and other cement structures subject to wear and severe action of the weather is supplied by the St. Louis Crushed Quartz Company, 303 Roe building, St. Louis, Mo. It is marketed under the name of crushed quartz and analysis and tests show high results, the tensile strength of briquettes reaching 368 pounds per square inch in eleven days and the strength in compression 4,506 pounds in

ERECTED ENTIRELY OF HARMON S. PALMER'S PATENT HOLLOW CONCRETE BUILDING BLOCKS
BY VANCE AND LAWSON, SPRINGFIELD, ILL.

sixteen days. Analysis shows that the stone is dolomite, a stone which should give a good binding with cement. The material can be graded to order from fine screenings to coarse or mill run. It can be delivered at much lower cost than crushed granite and very little above limestone crushings. Special siftings for artificial stone factories are a specialty of the company. It is claimed that this crushed quartz is much superior in durability to limestone crushings, not being subject to the failures which sometimes occur with the latter material from the action of the elements. Especially in the Mississippi valley this material should receive favorable consideration.

New Filter and Water Softening Plants.

The city of Elyria, O., has contracted with the New York Continental Jewell Filtration Company of New York for a filter plant of 2,000,000 gallons daily capacity, to purify the water of Lake Erie for city use. The Northern Hospital for the Insane at Winnebago, Wis., has decided to establish a large gravity filter of the same company.

The Chicago & Eastern Illinois Railway will extend its water purifying systems by adding one of this company's filter plants at its water station at Kinmundy, Ill. Mr. J. Frank Post of North Newark is well pleased with the work of the softening plant he purchased some weeks ago. He finds after ten weeks' use that no new scale has formed and that the old scale ½ inch thick, is loosening and will soon disappear.

An Excellent Record for Wabash Paving Block.

The construction of the new heating system in Indianapolis gave opportunity for the examination of many brick blocks taken from the trench in S. Meridian-st., the main wholesale street of the city. After eight years of hard usage the bricks show a wear of ¼ to ⅜ inch with an occasional brick showing ½ inch wear. The brick are the Wabash block, made by the Wabash Clay Company of Veedersburg, Ind., and this test of their material and method of manufacture is certainly very severe and the result is eminently satisfactory.

Sewer Pipe in Georgia.

H. Stevens' Sons Company has a factory at Macon, Ga., for the manufacture of sewer pipe which is kept busy in supplying the demands for its product in the South. It has recently completed the supply of the new sewer system at Dothan, Ala., and is now supplying pipe for the sanitary sewers at Bessemer, Ala., La Grange, Ga., and St. Petersburg, Fla. It is also filling an order for the extension of the system at Summerville, a suburb of Augusta, Ga. Orders for the United States government work at Port Charleston, S. C., and a yearly contract with the city of Charleston, S. C., require frequent shipments. These are all in addition to the daily car lot shipments to various southern points. The general use of the pipe is evidence of its satisfactory quality and the increase in this kind of work in the South will undoubtedly increase the sales from this plant still further.

Finishing Tools for Artificial Stone Walks.

Our readers have doubtless been interested in the articles descriptive of the methods of laying cement flagstone walks, curb, gutter, parapet walls, etc., by F. H. Crafts, which have recently appeared in this magazine, one article being in this number. Mr. Crafts is a civil engineer with much experience in this class of work and he has put his experience to good use in devising a set of tools for the work of laying the cement constructions mentioned. A sample tool which we have shows the best of material and workmanship and we believe his tools will be thoroughly satisfactory. Many of the tools have been illustrated in his articles and others are shown and described in his circulars and his pamphlet of directions for their use. His address is F. H. Crafts, 97 Glendale Park, Rochester, N. Y.

Two New Studebaker Buildings.

The foundations for the new Studebaker building in Kansas City are now nearing completion. The building, shown in the accompanying picture, will have a frontage on Thirteenth-st. of 116 feet, with a depth of 127. There will be about fourteen thousand square feet on a floor. The building will have a very handsome and imposing front eight or nine stories high, and the Studebakers expect to occupy about 60 per cent., renting the balance. The floors will all be made of granitoid, columns in the basement, first floor and second floor will be of iron, the balance of the columns, the girders and the joists, built upon the most improved mill construction ideas, will be of yellow leaf pine or Oregon fir; the floors being capable of carrying loads per square foot which are ordinarily needed by agricultural implement dealers. There will be

two large freight elevators, each 10x20 feet, and one large passenger elevator, six feet square.

The first floor will be devoted to shipping and will be accessible for teams, both from the front and the rear of the building. Track facilities will give opportunity to handle from five to six cars at one time. All elevators and stairways are inclosed in brick shafts, which run from the basement to the top of the building. All openings are to be protected with automatic standard fire-proof doors.

The floors will all be so constructed that they will drain through scuppers to the outside of the building. The building is practically fire-proof, and protected throughout by automatic sprinklers, reducing insurance to about one-third the rates prevailing throughout the bottoms. The elevators will be operated by electricity, and the building heated by steam.

The west elevator will run to the roof so that vehicles can be run out onto the roof for airing and sunning, if desired. The sprinkler tank will be twenty feet above this elevator. On account of this construction, the west elevator shaft will be run up about fifty feet above the roof to inclose the elevator machinery and the tank for sprinkling apparatus. This will give a tower effect on the Hickory-st. side which will be from 160 to 175 feet high. This tower will be used for displaying the sign of the Studebaker Brothers' Manufacturing Company, painted on all four sides, and the company is contemplating putting on top of the tower a big electric sign, containing the name

THE KANSAS CITY STUDEBAKER BUILDING.

"Studebaker," which, from its high position, can be seen at night in nearly all parts of the city.

The lobby on the Thirteenth-st. front will be handsomely tiled and decorated, and it will contain the main staircase and the rapid-running passenger elevator.

The first floor will be used by all occupants in common for shipping, the second floor will contain the offices and part of the display room of the Studebakers, they having not yet decided which of the other floors, saving the top, that they will occupy. They expect to conclude upon this after consulting with prospective tenants. The building will be ready for occupancy in the early spring. The wholesale business of the Studebakers will be conducted from this locality, and the retail business at the repository on Walnut-st.

In addition to this extensive improvement in Kansas City the Studebakers are building at the corner of Broadway, Forty-eighth-st. and Seventh-ave., in New York City, at the head of Long Acre-square, a very handsome repository building ten stories high, steel construction, fireproof. They expect to occupy this building Jan. 1 next, and propose to make it the vehicle center of New York City and the largest, most attractive and complete vehicle repository in the world. The business of the Studebaker Brothers' Manufacturing Company this year has been the largest that it ever experienced and it is rapidly growing. These extensive improvements being made by them certainly give evidence of this fact.

Trade Publications.

The Stevens Cast Stone Company, 100 Washington-st., Chicago, Ill., issues a circular with a short description of the process used in making its wonderful product and illustrations of buildings in which it has been used.

The Henry Martin Brick Machine Manufacturing Company, Inc., Lancaster, Pa., will send their 1903 calendar to inquirers for it as long as the supply lasts.

The rapid sketching device of the Universal Drafting Machine Company of Cleveland, O., is described in an illustrated four-page circular.

The Whitehall Portland Cement Company of Cementon, Pa., with general office in the Reading Terminal at Philadelphia, issues a handsomely illustrated booklet descriptive of its cement and the uses of it with good words from users.

The Allis-Chalmers Company sends its Book No. 1 illustrating the Gates Rock and Ore Breaker and Book No. 4 on Rock Crushing plants, made at its Gates works in Chicago. The Chicago offices are in the Home Insurance building. The appurtenances of the machines and plans for their installation and operation are included in the booklets.

"The Town Beautiful" is the title of a little illustrated pamphlet showing the advantages of reading "Park, Cemetery and Landscape Gardening," a monthly paper, and giving some samples of its contents.

The styles of cars and trucks for industrial truck and railroad uses manufactured by the Atlas Car and Manufacturing Company of Cleveland, O., are well shown in their new catalogue.

Catalogue No. 7 of the C. O. Bartlett & Snow Company of Cleveland, O., is devoted to elevating, conveying and general mill machinery of all kinds, and contains price list and much valuable information in tabular form. It fills 288 pages.

Complete catalogue No. 72 of the Jeffrey Mfg. Company, Columbus, O., takes 372 pages to list and illustrate the elevating, conveying and power machinery made by the company. It seems possible to supply any need in these lines from the stock shown.

The description of street railway and factory equipments recently installed is the subject of a pamphlet entitled "Work Done," which is issued by Westinghouse, Church, Kerr & Co. of Pittsburg, Pa.

The Trinidad Asphalt Manufacturing Company, St. Louis, Mo., issues a catalogue of its roofing, paving, paint and insulating materials.

The little catalogue No. 50 of the Peerless Manufacturing Company, New York, shows its engineers' specialties, such as packing, belting, hose, etc.

Trade Notes.

ASPHALT.

The F. D. Cummer & Son Company, Cleveland, O., has sold a Cummer semi-portable asphalt paving plant to the Marion Construction Company of Indianapolis.

The Barber Asphalt Paving Company will erect an asphalt plant at Ft. Dodge, Ia., at a cost of not less than $50,000. According to local reports it is the company's intention to make Ft. Dodge a main distributing point by manufacturing the crude material and shipping it from that point.

The Ontario Asphalt Block Company, Ltd., Ottawa, Ont., has been incorporated to manufacture asphalt blocks in Canada. Richard Bangham has resigned his position as street commissioner of Ottawa to become manager of the plant.

The Indiana Asphalt Company, Chicago, has been incorporated by Alexander G. Warren, R. W. Barnes and Arthur Griffin to manufacture asphalt.

BRICK.

The Euclid Shale Brick Company is being organized at Cleveland, O., by John E. Wheat, H. J. Wheat, J. J. Kelby, T. J. McManus and T. C. Willard.

The establishment of a plant near Toronto, Can., for manufacturing paving blocks out of furnace refuse is contemplated by W. Owen of London, England. Tests of the blocks show that they stand 200 tons pressure to the square foot. Plants have been established in England, West Amsterdam and the Transvaal.

The establishment of a vitrified brick plant in Oakland, Cal., is contemplated by manufacturers from Seattle, Wash., according to local press reports.

George W. Post, E. J. Wightman, George W. Schreck and Thomas Smith have organized a company at York, Neb., to manufacture building and sidewalk brick.

The plant of the Mayfield Vitrified and Pressed Brick Company, Mayfield, Ky., has been purchased by W. S. Cook, S. A. Norman, J. E. Wright and others.

The Coffeyville Shale Brick and Tile Company is being organized at Coffeyville, Kas.

A company is being organized by capitalists of Lake Linden, Mich., to manufacture paving brick from the stamp sand along the shores of Torch lake. Stamp sand is copper rock which has been stamped and pulverized, and the metal extracted.

CEMENT.

The Rapid City Cement Brick Company has been incorporated to manufacture brick at Rapid City, S. D.

A fourth cement plant will be erected soon at Quanah, Tex., according to press reports. J. L. Elbert is mayor.

Henry Thoele, Florence, Ala., writes that he wishes to purchase the machinery for a plant to manufacture cement from furnace slag.

A Portland cement plant will be erected at or near Rogers City, Mich., by H. H. Cohen of Cleveland, O.; W. T. Gayle of Washington, D. C.; F. S. Keith of Corona, N. Y.

The Apollo Cement Manufacturing Company is being organized at Pittsburg, Pa., and will erect a cement manufacturing plant near Apollo, Pa. Armin Schotte, Herman building, is president and K. J. Hendricks is secretary.

The International Cement Company, Philadelphia, has purchased land at Elizabeth, Pa., and will build a plant for the manufacture of cement from furnace slag under patents held by Dr. Otto Wuth of Pittsburg, who is interested in the company.

The Great Lakes Portland Cement Company has begun the erection of a plant at Rogers, Presque Isle County, Mich.

W. F. Cowham of Jackson, Mich., and about twenty-five business associates visited Crawfords' quarry, in Presque Isle county, Oct. 30, to examine stone and cement beds owned by Mr. Cowham. It is believed that a cement plant will be established at a cost of $3,500,000 to make cement out of clay and limestone similar to the plant in Alpena.

Hassan, Tagge & Dean, Engrs. and Chemists, 810 Union Trust Bldg., Detroit, Mich., secured the contract for the new cement mill to be built at Hull, Quebec, for the International Portland Cement Company of Toronto, Ont.

Hassan, Tagge & Dean, engrs and chemists, Detroit, Mich., have given up their office in that city and will move to Toronto, Ont.

The International Portland Cement Company, Toronto, Ont., has been incorporated under the laws of Ontario and will build a 2,000-barrel mill at Hull, Quebec, for the manufacture of high grade Portland cement. The materials to be used are limestone and clay. The company's directors are W. F. Cowham, P. W. Stanhope, A. F. McLaren, Dr. D. Jamison and J. S. Irwin. The office of the company is at Toronto, Ont.

The Western Canada Portland Cement Company has been incorporated with main offices at Winnipeg, to conduct business throughout Manitoba. The members of the company are W. F. Cowham, Jackson, Mich.; Alexander F. McLaren, Stratford, Ont.; David Jamison, Durham, Ont.; Philip W. Stanhope, Toronto; Joseph S. Irwin, Toronto.

W. C. McNeil is interested in the organization of the Iowa Cement Brick Company at Sioux City, Ia.

M. Kamerer, cement walk contractor, Fairbury, Ill., and John Krazeize have formed a company to be known as the Fairbury Cement Stone Works, and will manufacture cement blocks for building purposes.

The National Portland Cement Company of America has been organized in Chicago to take over the stock of the Superior Portland Cement Company, which is located near Martin's Creek, Northampton Co., Pa. The officers of the company are: President, H. N. Higinbotham; vice-president, W. M. Wright; treasurer, H. D. Higinbotham; secretary, J. W. Williams. Work on a new plant has begun.

The National Portland Cement Company, Jersey City, N. J., has been incorporated to deal in Portland cement, lime, limestone, etc., by Kenneth K. McLaren, Louis D. Bailey and H. B. Coughlan.

The plant of the Buckhorn Portland Cement Company, near Rowlesburg, W. Va., will be completed, according to press reports. Richard L. Humphrey, 413 Girard Bldg., Philadelphia, can be addressed.

A company will be organized by J. Frank Fields and others to build a cement plant at Hancock, Md.

A syndicate headed by Samuel Walker of Winnipeg, Man., contemplates erecting a cement plant near Morden, Man.

The Oolite Portland Cement Company, Louisville, Ky., has been incorporated by J. W. Jenner, R. K. Evans and Joseph L. Reid.

The West German Portland Cement Company, Detroit, Mich., will erect a plant forty mls. west of Detroit, Mich.

The Rice Lake Stone Company, Rice Lake, Wis., has been organized to manufacture cement sidewalks, tile and building blocks.

The Raymond Concrete Pile Company,

Jersey City, N. J., has been incorporated with main offices in the Merchants' bldg., Chicago, Ill.

The Albaugh Harley Company, Baltimore, Md., has been organized with offices at 540 E. Monument-st., to deal in cement, lime, etc.

The Pyramid Portland Cement Company, Detroit, Mich., has filed articles of dissolution with the secretary of state.

Lathbury & Spackman, Philadelphia, Pa., will erect and equip a 4-kiln rotary Portland cement plant for the Almendares Fabrica de Cemento Portland, on the north coast of Cuba, west of Havana.

The Allentown Portland Cement Company, Allentown, Pa., will build a plant at Whitehall, Pa.

The Diamond Cement and Lithographic Stone Company, Pierre S. D., has been incorporated by C. S. Anderson, J. A. Johanneses and L. L. Stephens.

The Commercial Club of Louisville, Ky., has appointed a committee to make researches in the vicinity of that city for raw cement materials with a view to erecting a Portland cement plant. The committee consists of Chas. P. Norton, president Commercial Club; T. R. Jefferson, J. C. Van Pelt, secretary of the club; Chas. R. Coates, Jno. L. Wheat, J. C. Miller, Louisville; Judge Stottenburg, Prof. J. F. Elsom, New Albany.

The plant of the Iroquois Portland Cement Company is being enlarged by the addition of a large storage building.

The Granite City Lime and Cement Company, Granite City, Ill., has been incorporated by A. W. Eisonmeyer, A. W. Morris and Chas. P. Wise.

The Georgia Portland Cement Company, Pierre, S. D., has been incorporated by William E. Dorwin, N. D. Pound and Roy Dorothy.

The Black Hills Cement and Brick Company, Pierre, S. D., has been incorporated by Thos. Sweeney, Jas. Halley, Rapid City, S. D.; H. M. Pulsifer, New York City.

The Quaker City Portland Cement Company, 26 Broadway, New York City, is reported as about to commence the erection of a large plant on land acquired in the Lehigh Valley cement belt. The company desires to correspond with engineers and others familiar with the requirements of an up-to-date plant.

The works of the Wabash Portland Cement Company, Wabash, Ind., will be closed about Dec. 15 for the purpose of installing seven new rotary kilns. Operations will be resumed as soon as the machinery is put in.

Capitalists of Columbus, O., contemplate locating a Portland cement plant in Jackson County, Ohio, on the land of the Jackson County Coal Company, according to press reports.

G. E. Voelkel of Los Angeles, Cal., has patented a method of fireproofing frame buildings by means of concrete and cement plaster.

LIGHTING.

The Walthes Lighting and Heating Mfg. Company has been incorporated to perfect a gas generator machine for heating purposes. The system has been patented by Edward Walther. The officers are: President, Henry Dunker; vice-president, A. W. Gifford; secretary, Edward Walther; treasurer, August Zschiesche.

The Higgs Acetylene Gas Generator Company, Chicago, Ill., is being organized to manufacture gas machines by I. W. Higgs, Hokon Hoyoss and John Varty.

The Essex Improvement Company has been incorporated to generate and distribute steam for heating and power purposes. The incorporators are John B. Woolston, Edwin W. Hall, A. Pratt and William H. Selkirk.

The Bloomingdale Oil, Gas and Development Company, Bloomingdale, O., is being organized by Dr. R. R. Adams, W. E. Van Eman of Bloomingdale, W. S. Lyons of Fostoria, E. D. Briggs, P. S. Bornhisel and W. A. Jones of Bairdstown, and J. Q. Adams of Toledo.

A syndicate acting through the Continental Trust Company purchased $2,000,000 of common stock of the U. S. Electric Light and Power Company, Nov. 15. The purchase of the control of the light and power company is believed to practically assure the launching of the Great Susquehanna river electric power development project by the syndicate.

The Moloney Electric Company, St. Louis, Mo., has been incorporated to manufacture, hold, sell or rent transformers, motors, dynamos and other electrical apparatus by T. O. Moloney, H. Murdock and J. J. Mullen.

The Electric Machinery Company, Minneapolis, Minn., has been incorporated to manufacture electric machinery and install plants for electric lighting. The officers are: President, James T. Bousted; vice-president, Charles H. Chalmers; secretary and treasurer, William J. Lare.

The Hebron Preserving Gas Company, Kittery, Me., has been incorporated to make and deal in preserving gases of all kinds. W. H. Southwick of Lynn is president and Horace Mitchell of Kittery treasurer.

The Crescent Electric Company, Utica, N. Y., has been incorporated by William P. Campbell, J. C. Eichmeyer, A. J. Potter, William H. Pryor, jr., and John Wenzel. The company will manufacture telephones, police and fire alarms and general apparatus.

The National Incandescent Lamp Company, St. Louis, Mo., has been incorporated by George W. Wadlow, Jones H. Parker and Henry M. Munn.

The Perfecto Gas and Gasoline Engine Company, 419 Market-st., Camden, N. J., has been incorporated by F. G. Henry, John Doak and J. N. Fitzgerald.

The United States Reduction and Refining Company will erect an electrolytic plant at Colorado City, Col., at a cost of $100,000. Chlorine gas will be manufactured by electricity. At present chlorine gas is manufactured by the method of hydrochloric acid treatment of chloride of lime. Charles M. MacNeill is vice-president of the company.

Newly incorporated electric light and gas companies: Jordan Electric Light

Company, Jordan, Minn.; Citizens' Light and Water Company, Mt. Carmel, Ill.; Warren Oil and Gas Company, Warren, O.; Gladys Electric Light, Water and Power company of South Dakota, Beaumont, Tex.; Temple Water, Light and Fuel Company, Temple, Ok. T.; Richmond Light and Power Company, Richmond, Cal.; Citizens' Electric Light Company, Bellwood, Pa.; Altamont Illuminating Company, Altamont, N. Y.

MISCELLANEOUS.

The Marcotte-Forbes Brick and Tile Company, Port Huron, Mich., has begun operations. The officers of the company are: President, Katherine Forbes; vice-president, Jennie Marcotte; secretary, E. R. Marcotte; treasurer, William Forbes.

The purchase of a scraper is contemplated at Deadwood, S. D. Mayor McDonald.

At the Dusseldorf Exhibition, which has just terminated, the highest award of merit, the gold medal, was awarded the "Hunt" Conveyor. This conveyor is manufactured by the C. W. Hunt Company, West New Brighton, N. Y.

The Decatur Bridge Company of Decatur, Ill., has been incorporated with a capital of $30,000, the directors being E. B. Tyler, W. Melville Wood and G. A. Caldwell of Muncie, Ind.; T. L. Blackburn of Lincoln, Ill.; J. R. Challacombe of Hillsboro, Ill., and Frank W. Ives of Bloomington, Ill. J. H. Burnham of Bloomington is also a stockholder. Buildings will be erected at once.

Recent Inventions.

708,8222. Sept. 2, 1902. Incandescent Gas Burner. Thomas Gordon, Philadelphia, Pa. Combination with an induction and mixing chamber, a gas supply pipe and an air supply pipe of elongated gas ingress ducts, an elongated air duct and an axially-disposed stem in the air duct.

708,233. Sept. 2, 1902. Hoop-lug. P. C. Jurs, jr., San Francisco, Cal.

708,248. Sept. 2, 1902. Method of molding artificial stone. Frank Orlikowski, Cleveland, O. Placing in a flask a layer of hard stone pieces, covering with flowing cement until solid, repeating this process on the body formed, tamping and leaving the stone with a flat finished top surface.

708,353. Sept. 2, 1902. Composition of fire-proof wall plaster. C. R. Harris and C. C. Barrick, Los Angeles, Cal. Consisting of clay, calcined plaster, cement, asbestos fiber and glue.

708,354. Sept. 2, 1902. Fire-proof wall plaster. C. R. Harris and C. C. Barrick, Los Angeles, Cal. Consisting of clay, calcined plaster, sand, cement, asbestos and glue.

708,395. Sept. 2, 1902. Device for digging ditches. Oscar Peterson and J. H. Clark, Chicago, Ill. Comprising a movable frame, two digging shafts and means for adjusting them at their ends so as to vary the angular relation between them.

708,589. Sept. 9, 1902. Hoisting gear for different buckets for use upon dredges, steam shovels, etc. A. W. Robinson, Montreal, Canada.

708,463. Sept. 2, 1902. Bridge construction. G. M. Cluney, Indianapolis, Ind. A combined abutment and wing walls, consisting of a metallic frame work adapted to contain and be embedded in cement.

708,532. Sept. 9, 1902. Mold for making cement stone. R. B. Coltrim, Jackson, Mich. A series of cores for molding machines adapted when placed together to form a series of compartments independent one of the other.

708,587. Sept. 9, 1902. Dredge bucket. A. W. Robinson, Montreal, Canada. A bucket, the back composed of a single casting having lugs for the direct attachment of the hoisting-tackle.

708,588. Sept. 9, 1902. Boom for dredges, excavators, etc. A. W. Robinson, Montreal, Canada. A boom having a tapering form from a turn table toward its free end and provided with lateral flanges.

708,590. Sept. 9, 1902. Steam shovel. A W. Robinson, Montreal, Canada. Combing a boom, hoisting engines and a drum, duplex gearing connecting the hoisting engine with the boom.

708,764. Sept. 9, 1902. Fireproof flooring. C. F. Haglin, Minneapolis, Minn. Combining a wall and concrete floor, a flanged beam secured to the wall and floor wires threaded through perforations in the flange of the beam and imbedded in the concrete floor.

709,022. Sept. 16, 1902. Rock-drilling engine. J. G. Leymer, Denver, Col.

709,046. Sept. 16, 1902. Pocket compass. C. C. Ranger, Butte, Mont.

709,199. Sept. 16, 1902. Portable mechanical loader and digger. F. C. Brown, Birmingham, Ala. Combining the body portion, a sliding base, a foot-plate on which is mounted a revolving plate, bucket-carrying apparatus, means for revolving and a motor supported on the sliding base.

709,217. Sept. 16, 1902. Post for fencing or other purposes. R. H. Guthrie, South Dumfries, Canada. Combining an outer casing of cement, a post imbedded therein, truss wires attached and a series of brackets secured to the post and extending through the cement casing.

709,224. Sept. 16, 1902. Fence post. W. R. Johnson, Van Wert, O. A post of plaster material, the support consisting of a continuous cable and composed of upright center and corner portions and short connecting portions.

709,384. Sept. 16, 1902. Method of treating garbage. S. E. Wilson, Frenchlanding, Mich. A process consisting in applying fluid under pressure to all parts of a mass of material, and thus passing the fluid under pressure through the mass.

709,450. Sept. 16, 1902. Apparatus for treating garbage. S. E. Wilson, Frenchlanding, Mich. A series of digesting plants with cooking apparatus. A low pressure plant connected to the digesting plants and connections between the low pressure plant and the cooking apparatus.

709,504. Sept. 23, 1902. Conduit. W. L. McGowan, Philadelphia, Pa. Consisting of tubular sections, the end of one provided with a projection, the end of the adjacent section having a complementary

recess, the highest point of the projection and the lowest point of the recess located at different distances from the median line of the tubular body.

709,597. Sept. 23, 1902. Rotary Force Pump. T. M. Frank, San Antonio, Tex. Combination with the cylinders and rotary pistons of slidable valves, valve shoes and the roller valve operated between the pistons to check the backward escape of air between the pistons.

709,616. Sept. 23, 1902. Apparatus for the Treatment of Garbage or Similar Material. Rougier Thorne, Greenwich, Conn. A receptacle provided with a discharge port, a perforated support, draining conduits removably attached, and means for lowering the support and conduits through the discharge port.

709,791. Sept. 23, 1902. Artificial Stone Board. Alexander McDougall, Duluth, Minn.

709,794. Sept. 23, 1902. Concrete Arch Construction. W. C. Parmley, Cleveland, O. Combination of bars transverse to the axis of the arch and passing continuously through all the regions of tension in both intrados and extrados, with longitudinal bars extending in the direction of the axis.

709,836. Sept. 23, 1902. Apparatus for Cooking Garbage. C. S. Wheelwright, Bistol, R. I. A digester formed in sections and provided with means for causing steam to permeate the contents in combination with a filtering apparatus having large teats above the upper conical section of the digester.

709,903. Sept. 30, 1902. Asphalt Hoe. Smith Harper, Abington township, Montgomery county, Pennsylvania, assignor to Smith, Harper & Sons. A blade, a shank integral with the blade with handle secured, a scraper-plate, and an aperture in the plate through which the shank is inserted.

709,921. Sept. 30, 1902. Grading and Excavating Machine. W. H. Morenus, Lakeview, Ia., assignor to F. C. Austin, Chicago, Ill. Comprising a wheeled body-frame, a plow, a conveyor-wheel to receive soil from the plow and carry it to the joint of discharge, a rotary winding-drum, a cable for tilting the conveyor-wheel and means of raising and lowering the tilting support on the body-frame.

709,946. Sept. 30, 1902. Garbage Furnace. R. L. Walker, New York. Combination of three fires, an unperforated false garbage floor being concave and exposed above and below to the action of the heat, and located so that two fires are consuming solid and liquid garbage and the third fire the gases from the garbage.

709,983. Sept. 30, 1902. Garbage receptacle. F. E. Holzhauer, Detroit, Mich. A deodorizing chamber secured to the cover of a garbage receptacle, the chamber containing two compartments, a liquid deodorizer in one, absorbent material in the other, and means whereby the removal of the cover will project a quantity of the deodorizer onto the absorbent material.

710,165. Sept. 30, 1902. Road roller. F. B. McAlpine, Marathon, N. Y., assignor to Climax Road Machine Company, same city. Combination of the roller of a continuous carrying frame encircling the roller and a draft appliance having a traveling trolley connection with the frame and shiftable to any position thereon.

710,308. Sept. 30, 1902. Fire-proof floor construction. Merrill Watson, New York. In concrete and metal construction, an embedded bar having a slopingly-incised and barbed surface to form a bond between the metal and concrete.

710,391. Sept. 30, 1902. Mold for forming concrete troughs or other articles. Isaac Haws, Hannibal, N. Y. Consisting of an outer and an inner case with hinged sides and ends, detached extensions to the bottom covering the thickness of the sides and ends that may be slid out vertically.

710,453. Oct. 7, 1902. Cart for collecting and removing sweepings. Albert Gull, Zurich, and Josef Muller, Eglisan, Switzerland. A chamber with openings in the top, a withdrawable receptacle, sockets in the openings and removable delivery vessels therein.

710,480. Oct. 7, 1902. Automatic air valve for water mains. C. E. Loetzer, Towanda, Pa.

710,525. Oct. 7, 1902. Apparatus for distributing liquids over filter beds. W. D. Scott-Moncrieff, Westminster, England. Combination of a distributing pipe, a trough arranged parallel to it and means to pass the liquid from the pipe into the trough and flow onto the surface of the filter beds.

710,592. Oct. 7, 1902. Combined wheeled scraper and dumping device. Marvin Mead, Pueblo, Col. Lever arms pivotally connected to the axle, the scraper suspended from the lever arms, the tongue pivotally connected to the frame, means for rocking the axle and a connection between the rear end of the tongue and the tail gate of the scraper.

710,703. Oct. 7, 1902. Automatic siphon. S. W. Miller, Chicago, Ill. Combination with a siphon comprising an intake limb, a discharge limb and an outlet pipe forming a liquid seal, of a passage connecting the latter two, having an upper interior surface which constitutes the boundary for the highest point of escape of the air.

740,749. Oct. 7, 1902. Mold for building concrete or cement walls. W. H. Caldwell, Williamston, Mich. Combination with loose boards superimposed upon each other upon the inner and outer faces of the wall and held in position by binders, of false mold-boards with spacing hooks upon their upper edges and suspended from the top edges of the boards forming the mold.

710,760. Oct. 7, 1902. Cement-mixing machine. T. W. Connolly, Detroit, Mich. A fixed barrel, adjustable blades mounted on a rotable shaft, and mains for adjusting all the blades simultaneous and equally.

710,835 Oct. 7, 1902. Garbage receptacle. H. P. Buck, Chicago, Ill.

710,995. Oct. 14, 1902. Machine for mold ing artificial stone. N. F. Palmer Brooklyn, N. Y. A movable core with actuating-rack, a movable false bottom, a pair of actuating lifters, a rock-shaft

and slotted lever-arms connecting the rock-shaft to the rack and lifters.

711,074. Oct. 14, 1902. Street-sweeper and conveyor. P. F. Renaud and W. P. Carey, New Orleans, La. A casing comprising a sweepings receptacle, a conduit, a rotary brush, an endless conveyor and means for rotating the brush and driving the conveyor.

711,115. Oct. 14, 1902. Method of utilizing old paving matrial. W. H. Lober, Philadelphia, Pa., assignor to the Barber Asphalt Paving Company, New York. Heating blocks of the material with steam and applying heat until the moisture is expelled, and then mixing with it new pavement composition.

711,277. Oct. 14, 1902. Cement railroad tie. W. J. Bell, Newaygo, Mich. In combination with a metallic tie-beam, a cement block in which the beam is imbedded, an opening in the block through which binding links pass, a ring or collar for each of the binding links and means for securing the ring in position.

711,524. Oct. 21, 1902. Concrete mixer. H. J. Phillips and M. F. Guiney, Washington, D. C. A wheeled receptacle of the wheelbarrow type provided with a dumping bottom, and a mixing device arranged in the receptable and driven by a supporting wheel.

711,512. Oct. 21, 1902. Gas generator for street lamps. E. B. Ludwig, Kansas City, Mo. Comprising a hollow post with reservoir in its base for the reception of liquid to be vaporized, means for supplying compressed air and a gas generator.

711,327. Oct. 14, 1902. Portable asphalt paving plant. George Merriman and Herman Merriman, Allegheny, Pa., assignors to the Toledo Patcher Company, combining a boiler, engine, a rotary sand drier, a furnace, a melter above the drier, a sand elevator, a mixer, a longitudinal shaft, means for operating the shaft from the engine, means for operating the drier and sand elevator from the shaft, and a link belt geared to the shaft and a shaft of the mixer.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Norristown, Pa.—Warren Bros. Company of Boston have completed twenty-four blocks of bituminous macadam paving.

Chicago, Ill.—Mayor Harrison favors the installation of a municipal creosoted paving block plant at the bridewell.

Kokomo, Ind.—(Special.)—The W. Mulberry-st. brick paving has been completed and some dissatisfaction exists, but it is believed that it will be accepted.

Niagara Falls, N. Y.—A party of city officials and citizens left Nov. 16 for Rome, Schenectady, Albany and Troy for the purpose of inspecting bituminous macadam pavements.

Omaha, Neb.—The Barber Asphalt Paving Company has agreed to repair all of the asphalt paving in this city free of charge, whether the guarantee to keep in good condition has expired or not.

Cincinnati, O.—A resolution was introduced Nov. 14 directing the city engineer to notify all asphalt companies having contracts with this city to keep streets in repair to begin the work immediately in order to have the streets in good condition by the time cold weather begins.

Columbus, O.—The city attorney submitted an opinion to the committee on streets, Nov. 12, relative to the duty of the council in the matter of the second passage of appropriation ordinances to pay bills and pay-rolls. He holds that the appropriation in the tax levy of a certain amount to run each department rendered unnecessary a second passage of appropriation ordinances for the ordinary payment of salaries and contingent expenses.

CONTEMPLATED WORK.

Red Oak, Ia.—W. First, Second and Third-st. will be paved.

Superior, Wis.—The question of paving is being considered.

Fond du Lac, Wis.—Brick paving is recommended for Main-st.

Marseilles, Ill.—The question of block paving is being agitated.

Portland, Ore.—Bids will be readvertised for improving Failing-st.

Glenville, O.—St. Clair-st. will be paved. E. E. Boadt, vil. engr.

West Superior, Wis.—Considerable paving is contemplated for next year.

Quincy, Mass.—The question of street improvements is being discussed.

Owosso, Mich.—This city voted to issue $30,000 bonds for paving Main-st.

Lee, Mass.—The town voted to appropriate $3,000 for improving Center-st.

Oakland, Cal.—The question of vitrified brick paving is being discussed.

Savannah, Ga.—An ordinance has been adopted to pave Thirty-sixth-st. with vitrified brick.

Newark, N. J.—Asphalt or granite block paving is recommended for Campbell-st.

West Duluth, Minn.—The question of paving Fifty-fifth-ave. will be considered.

Newport, Va.—Contracts will be let soon for paving West-ave. and River-road.

La Crosse, Wis.—Brick paving is proposed for a large number of streets next year.

San Francisco, Cal.—An ordinance has been passed for paving Spear-st. between Missouri and Market.

St. Joseph, Mo.—President Imel is in favor of requiring competition on all brick paving.

Fort Dodge, Ia.—The city council has finally decided to pave a number of streets with asphalt.

Salem, Mass.—Plans for rebuilding Lynnfield road have been prepared. Edw. A. Bishop, chm. co. comrs.

Davenport, Ia.—Estimates for paving during 1903 have been prepared, including a large number of streets.

Swarthmore, Pa.—The cy. coun. will issue $20,000 bonds for street improvements. E. Sellers, boro secy.

St. Paul, Minn.—Bids will be asked soon for paving Nina-st. with asphalt and Eagle and Ninth-sts. with sandstone.

Steubenville, O.—Favorable action has been taken on the petitions and ordinances for paving two alleys.

Santiago, Cuba.—Edwardo J. Chibas has been engaged to submit a report on street improvements in this city.

Frankfort, Ill.—The question of building cement walks in this village has been suggested for consideration.

Washington, Ia.—The paving of a public square and a block leading each way therefrom with brick is contemplated.

Atchison, Kas.—The cy. council has decided on 9,781 sq. yds. of paving and 5,550 lin. feet of curbing on Eleventh-st.

Woonsocket, R. I.—An ordinance is pending providing for an appropriation of $44,000 for highway construction.

Pittsburg, Pa.—A resolution has been passed appropriating $40,000 for repairing N. Negley-ave. and $9,500 for Stanton-ave.

Newport, R. I.—Bonds to the amount of $50,000 will be issued for paving Broadway and Spring-st. with macadam.

Ogden, Utah—Paving is contemplated for Washington-ave., between Twenty-fifth and Twenty-sixth-sts. W. L. Critchlow, cy. recorder.

Hannibal, Mo.—Plans and specifications for paving N. Third-st. are being prepared, according to press reports.

Portland, Ore.—The city engineer has been directed to prepare estimates for the improvement of Alder-st. before Jan. 1.

Weston, O.—The question of macadamizing the roads of Weston township has been favorably voted on. F. A. Henderson, town clk.

Toledo, O.—The council committee on streets approved a petition Nov. 13 to pave Consaull-st. between Front-st. and Payne-ave.

Grand Rapids, Mich.—The estimated cost of improving Dale-ave., from Canal to N. Costi, is $6,559. L. W. Anderson, cy. engr.

Indianapolis, Ind.—A report recommending the passage of the $100,000 boulevard bond ordinance has been submitted to the city council. Ordinances have been passed for paving sidewalks on St. Peter-st., Ringgold-ave. and Ohio-st. with cement.

Montgomery, Ala.—Mayor Joseph has been authorized to ask for bids for paving the sidewalks around the Capital Hill school.

Sacramento, Cal.—Surveyor Pierson has been directed to prepare specifications for paving K-st., from Front to Second, with basalt blocks.

Gloversville, N. Y.—About 17,000 sq. yds of macadam and 8,000 sq. yds. vitrified brick paving is contemplated. Morrel Vrooman, cy. engr.

Beaumont, Tex.—The citizens on Calder-ave. contemplate paving that thoroughfare, but have asked the city to put in the street crossings.

Milton, Pa.—The question of issuing $12,000 bonds for the purchase of a stone crusher and a steam road roller will be voted on Feb. 17.

Dallas, Tex.—Plans have been submitted for repaving Main-st., from Ervay-st. to Exposition-ave. Asphalt is favored. Hugh Raines, cy. engr.

Los Angeles, Cal.—The question of building boulevards to connect the principal towns and hamlets of Orange county is being discussed.

Spencerport, N. Y.—This town has requested the Albion Electric Ry. to pave or macadamize the street it wants to use for its street railway line.

St. Joseph, Mo.—Tenth-st., from Grand-ave. to Atchison-st., 42 blocks, may be converted into a boulevard and paved with asphalt.

Ann Arbor, Mich.—Cy. Engr. Groves estimates the cost of paving State-st., at $32,000, which is $6,000 less than the first estimates submitted by him.

Chicago, Ill.—Commissioner of Public Works Blocki and Superintendent of Streets Doherty visited Indianapolis Nov. 14 to investigate creosoted wood block paving.

Salt Lake City, Utah—The city council has recommended that the intersections at Second West-st., between First and Second North-sts., be paved with stone.

Petaluma, Cal.—(Special.)—N. S. Frost, cy. engr., says that resolutions of intention to grade, curb and macadamize Third-st., from F to I, have been passed.

Cincinnati, O.—City Engineer Stanley has been directed to prepare plans and specifications for paving Hackberry-st. with brick and Park-ave. with asphalt.

East St. Louis, Ill.—Contracts will be let soon for paving Breghton-place, Howe-ave., Chartrand and Veronica-aves. with vitrified paving brick with asphalt gutters.

San Jose, Cal.—The council decided Nov. 17 to ask for bids for 4,500 cu. yds. of gravel and 200 barrels of Portland cement to be used in repairing E. Santa Clara-st.

LaCrosse, Wis.—The street committee has decided to pave Fifteenth-st. next year, consisting of twenty blocks of brick paving and fifty blocks of granite top dressing, according to press reports.

Niagara Falls, N. Y.—The common council rescinded its action on the proposed asphalt paving for Niagara-ave.

and declared its intention to pave with bituminous macadam.

St. Louis, Mo.—Bills for improving nineteen streets, including the extension of Pine boulevard, from Fourth to Nineteenth, have been favorably reported. The paving will be of asphalt and granite.

Henderson, Ky.—The city council has authorized the preparation of an ordinance for paving First-st., from Main to Green, two blocks, with vitrified brick.

Tacoma, Wash.—The commissioner of public works was directed, Nov. 12, to ask for bids for building cement or other fireproof walks on a large number of streets.

Dayton, O.—The Ayres Asphalt Paving Company has been authorized to repair Xenia-ave., Jackson, Green, Sixth, Ludlow, Stratford, Fourth, Wilkinson, Fifteenth and Perry-sts.

Evanston, Ill.—Paving is proposed for Dempster-st. between Ridge and Dodge-aves. Granite top macadam is the material petitioned for. John H. Moore, city engineer.

Swansea, Mass.—The sum of $6,000 will be appropriated for constructing a new road from Bark-st. to the Somerset town line; also $500 was appropriated for new sidewalks

Springfield, O.—The street and alley commission of the city council has acted favorably on the ordinance to pave Cook, Spring and Edwards-sts. with brick on concrete base with stone curbing.

Joplin, Mo.—Estimates have been prepared for grading Pearl-st. from Twentieth to Twenty-first-st., building second-class sidewalks on First-st.; grading Third-st. from Marion-ave. to Kentucky-ave. A resolution was adopted Nov. 18 to macadamize Pearl-st. from Twentieth to Twenty-first-st.

Baltimore, Md.—B. T. Fendall, cy. engr., has submitted estimates of the cost of paving Randall, Little Ross, Little Garden, Monument, Madison, Bolton, Exeter and other streets and avenues with vitrified brick, wooden blocks, Belgian blocks and asphalt blocks.

Kalamazoo, Mich.—Bids will be asked for street paving so that the contracts may be awarded by Jan. 1. John J. Knight, O. K. Blickhout, A. B. Scheid and George S. Pierson have returned from an eastern trip, which they made for the purpose of inspecting pavements.

St. Joseph, Mo.—Paving ordinances were introduced, Nov. 17, as follows: Sixteenth-st., from Edmond to Olive, macadam; Twenty-first-st., from Mulberry to Jule, grading; Twenty-first-st., from Mulbery to Jule, asphalt; Twentieth, from Clay to alley south of Mulberry, brick; Olive from Thirteenth to Fifteenth, and Nineteenth, from Messanie to Charles, macadam.

Fond du Lac, Wis.—Mayor A. L. Bishop, Cy. Engr. E. B. Parsons, Aldermen G. W. Watson, O. A. Piggott and F. E. Schaefer visited Milwaukee, Chicago, Oshkosh and Columbus, O., for the purpose of investigating street paving. Bids will probably be asked in January for paving Main-st., from Forest-ave. to W. Division-st.

Oakland, Cal.—Resolutions have been passed for macadamizing Seventh-st., from Oak to Fallon. A resolution to build cement walks on Broadway, between Twentieth and Twenty-first-sts., has been referred to the street committee.

CONTRACTS TO BE LET.

Guthrie, Ok. T.—Bids are asked until Dec. 11 for paving certain streets with vitrified brick. Geo. Sendelbach, cy. clk.

Bloomfield, Ind.—Sealed bids are asked until 2 p. m., Dec. 10, for constructing gravel and macadamized roads. Bd. co. comrs.

Baltimore, Md.—Bids are asked until Dec. 3 for grading, curbing and recurbing and paving with brick Northwest-st. B. T. Fendall, cy. engr.

Kentland, Ind.—Sealed bids are asked until 12 m., Dec. 9, for constructing free macadam roads in Colfax twp. Edw. E. Parsons, chm. bd. co. comrs.

Toledo, O.—Sealed bids are asked until 12 m., Dec. 8, for paving Wayne-st. from Western to Detroit-aves. with vitrified block or asphalt block. Chas. H. Nauts, cy. clk.

Laporte, Ind.—Sealed bids are asked until 11 a. m., Dec. 11, for constructing a series of macadamized roads in Center and Coolspring twps. John R. Weaver, chm. co. comrs., Francis H. Roran, co. audt.

Green Bay, Wis.—Sealed bids are asked until 12 m. Dec. 11 for grading, ditching and otherwise improving Smith, Harvey and Madison-sts. and Webster and Norwood-ave. Frank E. Murphy, chmn. com. on sts. and bridges.

Portsmouth, Va.—Sealed bids are asked until 8 p. m. Dec. 22 for paving certain streets with sheet asphalt, asphalt block, vitrified brick, granite blocks and bituminous macadam. C. W. Walker, chm. st. com.

New York City.—Sealed bids are asked until Dec. 2 for regulating, grading and repaving the roadway of Seventh-ave., from One Hundred and Tenth to One Hundred and Twentieth-st., 23,650 sq. yds., with bituminous macadam; 800 lin. ft. new curbstone; 4,300 lin. ft. old curbstone. Jacob A. Cantor, boro prest.

Des Moines, Ia.—Sealed bids are asked until 11 a. m. Dec. 2 for the following improvements: Park Lane, 3,663 sq. yds. of vitrified brick paving and 2,565 lin. ft. curbing; E. North-st., 940 lin. ft. curbing; W. Fifth-st., 5,190 ft. curbing; paving alley with brick, 1,188 sq. yds. W. Twenty-fifth-st., 926 ft. curbing. J. E. Stout, chmn. B. P. W.

CONTRACTS AWARDED.

Akron, O.—J. M. Davidson was awarded the paving contract for $18,474.

San Francisco, Cal.—Flinn & Treacy have been awarded the contract for paving Lynch-st.

Everett, Wash.—The contract for constructing the water-front roadway has been awarded to J. M. Collins for $6,069.

Schenectady, N. Y.—The contract for grading Linden-st. was awarded to the Schenectady Contracting Company for $1,860.

Vincennes, Ind.—The contract for building eight miles of gravel roads was awarded to Singer & Ridgway of Sanborn, Ind., for $18,500.

Cairo, Ill.—The contract for paving Ohio Levee-st., from Sixth to Eighth, with vitrified brick, has been awarded to Fraser & Quinn.

Cincinnati, O.—The contract for improving Mansion Place, from Warsaw to Osage, has been awarded to A. J. Henkel & Bro., for $5,532.60.

Dayton, O.—The contract for repairing the asphalt pavement on Third-st. was awarded to the Ayres Asphalt Paving Company of Zanesville, at $1.70 a sq. yd.

Silver Lake, N. Y.—The contract for constructing a Telford and macadam road in Silver Lake park was awarded Nov. 17 to A. R. Gold of Tompkinsville for $14,500.

Riverside, Cal.—The contract for improving Lemon-st. was awarded Nov. 12 to Jas. McNair for $14,901.17 and for improving West-st. to Zeno De Moss for $17,962.

Springfield, Mo.—Paving contracts were awarded Nov. 12 as follows: Paving High st., R. B. Hart; reconstructing Boonville-st. from the bridge to the square, George Hollman & Co.

Kansas City, Mo.—Paving contracts have been awarded as follows: Twentieth, Walnut and Oak-sts., Parker-Washington company, $19,945; Lexington-st. from Bales to Askew, Gibson Company, $2,174; Tracy-st., Barber Asphalt Paving Company, $2,045.

Toledo, O.—The contract for 20,086 sq. yds. of paving on Front-st. was awarded Nov. 3 to C. H. G. Jennison of this city for $52,429.12. Medina blocks on concrete will be the material. The contract for paving an alley west of Hoag-st. was awarded Nov. 13 to Patrick Tansey.

Louisville, Ky.—The contract for paving Paterson-ave. from Frankfort-ave. to a point 1,200 ft. south with asphalt was awarded Nov. 19 to the Barber Asphalt Paving Company, at $1.48 a sq. yd. The contract for constructing brick paving was recently awarded to Lee Fig and George W. Gosnell for about $40,000.

Milwaukee, Wis.—The contract for paving the Sixteenth-st. viaduct with creosoted blocks has been given to the Republic Chemical and Creosoting Company of Indianapolis. The Terre Haute Creosoting company had the contract, which specified that the paving should be completed within forty-five days of the date of the order. The time expired Nov. 15, and only two days' work had been accomplished.

Indianapolis, Ind.—Paving contracts were awarded Nov. 14 as follows: Alley east of Delaware-st. from New York-st. to alley south of New York-st., Capitol Paving and Construction company, $1.02 a lin. ft.; alley south of New York-st. from Hudson-st. to an alley west of Hudson-st., Capitol Paving and Construction company, $1.04 a lin. ft.; Geisendorff-st. from New York to Washington, American Const. Co., $2.78.

Boston, Mass.—The contract for paving Columbia road between I and Q-sts., So. Boston, was awarded Nov. 17, to H. P. Nawn of this city as follows: Removing trees, $50; earth excavation and subgrading, 24 cts. a cu. yd.; gravel, $1 a cu. yd.; edgestones, 17 cts. a lin. ft.; telford base, 33 cts. a sq. yd.; 4-in. macadam, 17 cts. a sq. yd.; 9-in. macadam, 24 cts.; flagging, $2.25 a sq. yd.; brick paving, 35 cts.; gutter paving, 55 cts.; 5-in. crushed stone sidewalk, 17 cts. a sq. yd.; 4-in. crushed stone sidewalk, 16 cts.; loam,, $1.15 a cu. yd.; total, $37,821. The contract for Columbia road between Buttonwood-st. and the N. Y., N. H. & H. R. R., Dorchester, was awarded to P. Doherty for $9,748.

Buffalo, N. Y.—Bids for paving were submitted Nov. 14 as follows: Repaving So. Division-st. from Emslie to Lovel—Asphalt, Barber Asphalt Paving Company, $4,049; brick, H P. Burgard, $5,948; block stone, H. P. Burgard, $8,000. Repaving So. Division from Ellicott to Michigan—Asphalt, H. P. Burgard, $4,000; brick, Barber Asphalt Paving Company, $6,706; block stone, H. P. Burgard, $8,700. Repaving Seventeenth-st., Connecticut to Vermont—Asphalt, H. P. Burgard, $1,900; brick, Barber Asphalt Paving Company, $3,284; block stone, H. P. Burgard, $4,000. Repaving Niagara-st. from Hertel-ave. to Cornelius creek—Asphalt, H. P. Burgard, $11,000; brick, Barber Asphalt Paving Company, $17,807; block stone, H. P. Burgard, $23,500. Repaving Willow-place, Kingsley-st. to 279 ft. north—Asphalt, Barber Asphalt Paving Company, $2,244; brick, H. P. Burgard, $2,500; block stone, H. P. Burgard, $3,000.

SEWERS.

Chicago, Ill.—The intercepting sewer at Fifty-seventh-st. and Stony Island-ave. collapsed Nov. 18. The city engineers claim that incompetent help has been forced on them by the civil service commission.

Morristown, N. J.—The Sanitary Protection Co. of Morris county has been organized to aid in the protection of the public health within the limits of the county, and to take such means as may be proper and lawful to protect the community against the violation of the laws of health in the county.

Janesville, Wis.—An injunction has been issued restricting this city from completing a large sewer which is designed to enter into the race. The Blodgett Milling company began the action in behalf of the property-owners on the race, who are entitled to a number of inches of water from the race and who object to sewage being emptied into it.

CONTEMPLATED WORK.

Athens, Ala.—A sewerage system is proposed.

Marseilles, Ill.—A sewerage system is proposed.

Iowa City, Ia.—A sewer will be built in certain alleys.

Lewistown, Pa.—The construction of sewers is contemplated.

Chicago, Ill.—A sewerage system from Thirty-ninth to Fifty-fifth-st. is urged.

Neosho, Mo.—The question of a sewerage system is being considered.

St. Paul, Minn.—The St. Anthony Park sewer will be built next year.

Northfield, N. H.—This town voted to build a new sewer in Howard-ave.

Shreveport, La.—A resolution was passed Nov. 19 to build lateral sewers.

Tonawanda, N. Y.—A sewage disposal plant is proposed.

Hannibal, Mo.—A sewerage system and culvert on Grand-ave. is contemplated.

Galena, Ill.—A resolution has been adopted to build a sewer on Lower Hill-st.

Pekin, Ill.—The question of building sewers on the south side is being urged.

Grandon, Wis.—Immediate action will be taken towards building a sewerage system.

Long Beach, Cal.—This city voted to issue $30,000 for building a sewerage system.

Long Beach, Cal.—The citizens are in favor of building a comprehensive sewerage system.

Portsmouth, Va.—The question of extending the Union-st. sewer is being considered.

Miles City, Mont.—A sewerage system at Ft. Keogh is contemplated next season.

Syracuse, N. Y.—The estimated cost of building a brick sewer in Midland-ave. is $28,000.

Topeka, Kas.—A 36-in. brick or pipe sewer in Euclid-ave. is contemplated. City Engineer McCabe.

Manitou, Col.—Preliminary surveys for extending the sewerage system have been authorized.

Oklahoma, Ok.—The extension of the First-st. storm sewer, a distance of 3,100 feet, is contemplated.

Athens, Tenn.—A committee has been appointed to investigate the cost of building sewers.

Richmond, Va.—The mayor has authorized the construction of a sewer on Potter-st. at a cost of $3,500.

Washington, Pa.—A sewage disposal plant and additional sewers are contemplated. Hugh H. McCleery, cy. clk.

St. Joseph, Mo.—This city will probably issue $200,000 bonds next year for extending the main sewers.

Norfolk, Va.—The question of building an adequate system of sewers in the Seventh ward will be voted on.

Oregon City, Ore.—Plans and specifications for a sewer in district No. 3 are being made by C. W. Paget.

Collinwood, O.—The question of issuing bonds for building sewers in all the streets will be voted on.

Monmouth, Ill.—The construction of a new central sewer has been recommended by the board of local improvements.

Milwaukee, Wis.—The city engineer estimates the cost of the proposed Kinnickinnic flushing tunnel at $145,000.

Connersville, Ind.—Contracts, plans and specifications for a combined sewerage system are in preparation by Consulting Engineer Charles C. Brown of Indianapolis. Mayor Clark.

Penn Yan, N. Y.—William T. Morris has applied for a franchise for building a complete system of sewers in this town.

Johnson City, Tenn.—The council has appropriated $900 for preparing plans and specifications for a sewerage system.

Santiago, Cuba.—Edwardo J. Chibas has been engaged to prepare plans for a sewage disposal works.

Dallas, Tex.—The question of improving the sewerage system is being discussed by the business men and the Commercial club.

Madison, Wis.—Plans and specifications have been filed for sewers in the Greenbush district. O. S. Norsman, cy. clk.

Fernandina, Fla.—Plans and specifications for a sewerage system are being made and bids will be asked about Dec. 1.

Tacoma, Wash.—A resolution has been adopted to build 8-in. pipe sewers in district No. 126. F. B. Woodruff, cy. clk.

Glassport, Pa.,—The citizens have voted to issue $60,000 bonds for sewers and other improvements. P. S. McMullen, boro. engr.

Doylestown, Pa.,—A franchise will probably be granted the Doylestown Sewerage Company for operating a sewerage system in this borough.

West Hoboken, N. J.—A resolution has been adopted providing that the street com. have plans made for relief sewers in this city.

Hudson, Mass.—Geo. A. Tripp is chairman of a committee to consider sewerage construction. The committee will report in March.

Beaver Dam, Wis.—A resolution was passed Nov. 14 to build a main sewer in High-st. H. S. Gilmore, Mayor; F. J. Mirlach, cy. clk.

North Plainfield, N. J.—A complete sewerage system is contemplated at a cost of $48,000 and a sewage disposal plant at $38,000.

Johnstown, N. Y.—About 800 ft. of 20-in. vitrified pipe sewer with 8 intake basins will be constructed. J. W. Miller, cy. engr.

New Orleans, La.—The secretary of the sewerage and water bd. has been directed to advertise for bids for sixty days for sewer construction.

Springfield, Mass.—An appropriation of $10,000 is proposed for street improvements, including sewers in Summer and Springland-aves.

St. Paul, Minn.—The residents of St. Anthony Park are urging the necessity of constructing a main sewer to their section of the city.

Cienfuegos, Cuba.—H. J. Reilly of New York City has been engaged to make plans and specifications for the construction of a sewerage system.

Wichita, Kas.—A contract will probably be given some engineering firm for making plans for a storm water sewerage system for this city.

Canajoharie, N. Y.—Plans for the new swerage system are being made by Morrell Vrooman, and bids will probably be asked about Dec. 1.

Cincinnati, O.—J. A. Stewart, engr. at Norwood, has prepared two plans for a sewerage system to drain the northwestern suburbs of this city.

Wilmington, Del.—An 18-in. sewer in Thirteenth-st., from Heald to Brandywine, is contemplated. A resolution was

introduced Nov. 17 providing for the construction of a large brick sewer in Thirty-seventh-st., from Galena-st. to Sarnow-place, thence to Lisbon-ave., thence to Pabst.

Colwyn, Pa.—This town voted to issue $7,000 for extending the sewerage system and improving the public highways. John C. Wolfender, clk. coun.

Seattle, Wash.—A resolution has been introduced providing for adequate sewerage system for the district near Twenty-fourth-ave. and Madison-st.

Fresno, Cal.—The question of issuing $55,000 bonds for a septic tank and intercepting sewer will be voted on in December. I. Teilman, cy. engr.

Mountain Lake, Minn.—County Surveyor Brooks of Mankato has been engaged to make plans and specifications for a sewerage system for this place.

Northampton, Mass.—The estimated cost of extending the sewerage system to the Connecticut river is over $100,000. L. M. Thacher, engr. comn.

Ardmore, Pa.—The commissioners of lower Marion township will submit to vote in February the proposition to borrow $250,000 for building a sewerage system.

Athol, Mass.—This town voted to borrow money for the completion of the new sewerage system and for a new system for the Green and Sanders-st. districts.

New Orleans, La.—The executive committee of the sewer and water board has recommended that bids be asked for a number of small contracts for sewer work.

Holyoke, Mass.—The board of public works has authorized the construction of a new sewer in the Highlands, near Hampden and Nonotuck-sts. by Engineer Tighe.

York, Pa.—An ordinance has passed final reading providing for an election to vote on an increase of this city's indebtedness to build a sewerage system.

Newark, N. J.—The plans for the Badger-ave. and Peddie-st. sewer provide for a brick or concrete sewer 3,600 feet long in Badger-ave. and 3,800 feet in Peddie-st.

Brooklyn, N. Y.—The early construction of the remaining section of the Foster-ave. sewer has been recommended by Commissioner Redfield, estimated cost $500,000.

Grand Rapids, Mich.—The board of public works has been directed to reject all bids for constructing the west side sewer and to readvertise for bids until Feb. 2.

Atlantic, Ia.—Plans for a sewerage system, including 30 mis. of pipe, have been made by the Iowa Engineering Company of Clinton, and bids will be asked next spring.

Athens, Ala.—A committee has been appointed to investigate and report at once on the financial condition of the town preliminary to building an adequate sewerage system.

Syracuse, N. Y.—The improvement of the Skaneateles sewerage system is contemplated for next year. This is made necessary for the protection of this city's water supply.

Memphis, Tenn.—Lenox, a suburb, will be incorporated in the city of Memphis, and a bill submitted to the legislature asking for authority to levy a special tax of $200,000 for sewers.

Tonawanda, N. Y.—The state board of health commissioners is considering the advisability of ordering all cities and villages in the state that have been discharging sewage and other refuse in government waters to build sewage disposal plants.

North Yakima, Wash—(Special.)—Ernest McCulloh of Lewiston, Idaho, has been engaged to prepare plans for carrying off underground water during the season of irrigation. Plans for a complete system will also be prepared

CONTRACTS TO BE LET.

Vincennes, Ind.—Bids will be received Dec. 8 for building the St. Clair-st. sewer.

Dixon, Ill.—Bids are asked until Dec. 7 for building sewers in several streets. F. A. Truman, Prest.

Elkhart, Ind.—Bids are asked until Dec. 10 for building a 12-in. pipe sewer in Nadel-ave. E. V. Anderson, cy. clk.

Massillon, O.—Bids are asked until Dec. 2 for building sewers in Duncan and Walnut-sts. O. C. Volkmer, clk. sewer comn.

Cincinnati, O.—Bids are asked until Dec. 12 for building sewers and drains in several streets. Robert Allison, Prest. B. P. S.

Des Moines, Ia.—Sealed bids are asked until Dec. 2 for building sewers in Cottage and Twelfth-sts. J. E. Stout, chm. B. P. W.

Walnut, Ill.—Bids are asked until Dec. 5 for enlarging the main ditch of district No. 1 of Hamilton and Hahneman twps. Jas. Foley, chmn.

Akron, O.—Sealed bids are asked until 12 m. Dec. 2 for building a main trunk sewer in district No. 4 in Oil-st. Chas. H. Isbell, clk. bd. cy. comrs.

St. Petersburg, Fla.—Sealed bids are asked until Dec. 10 for building a sewerage system, including 3,600 ft. 15, 12, 10, 8 and 6-in. pipe sewers, 5 manholes and 5 flushtanks. J. P. Tilcomb, cy. engr.

Milwaukee, Wis.—Bids for building filter beds at the county poor farm sewage disposal plant were submitted as follows: W. T. Werner, $14,495; Reichert Construction Company, Racine, $16,225; A. A. Lewis, $16,910; Jas. Cape and Son, Racine, $17,153.

South Orange, N. J.—Sealed bids are asked until Dec. 2 for building a sewerage system, including the following: 13,700 ft. 10-in. and 105,780 ft. 5-in. sewer pipe, 786 ft. 12, 10, 8-in. c. i. railroad and river crossings, 243 manholes, 79 flushtanks and 2,500 cu yds. roak. Robert Sinclair, prest. vil. bl. trustees.

Washington, D. C.—Sealed bids are asked until Dec. 20 for constructing the substructure and foundations, including masonry conduits, screen and sediment chambers, gate wells, pumps, wells and structures pertaining thereto, the superstructure including stack coal tower, conveyor bridge, etc., of the sewerage pumping station. H. B. F. MacFarland, chmn. dist. comrs.

CONTRACTS AWARDED.

Revillo, S. D.—Edward McCue received the contract for a drainage system.

Ashland, Ky.—The contract for a sewer in Railroad alley was awarded to Amos Trainor for $2,347.

Ft. McRae, Fla.—Henry Monk has been awarded contracts for sewer and water systems for $12,000.

Syracuse, N. Y.—Gleason & Kiely secured the contract for a sewer in the First ward for $38,221.

Seattle, Wash.—J. A. Bailey was awarded the contract for a sewer in E. Alder-st. for $1,876.

Sacramento, Cal.—The contract for building a sewer on Front-st. was awarded Nov. 10 to Henry Dehn.

Schnectady, N. Y.—The contract for building the Mill Creek culvert sewer was awarded to Kellam & Shopper for $4,566.

Boise, Idaho—The contract for building a sewerage system at the State University at Moscow was awarded to William Harkins.

Nashville, Tenn.—The contract for constructing the Edgefield trunk sewer was awarded Nov. 6 to E. T. Lewis & Co. for $58,895.

Wichita, Kas.—The contract for building sewer No. 3, in the northern part of town, has been awarded to N. L. Halloweil for about $1,000.

Cincinnati, O.—The contract for building 1,000 ft. of brick sewer in Jerome-ave. was awarded Nov. 6 to Thomas P. Strack for $30,000.

Salisbury, Md.—R. McKerney Price was awarded the contract for building a sewer in Isabelle-st., from Division-st. to the river, for $671.54.

Cincinnati, O.—Sewer contracts were awarded Nov. 13 as follows: Grace-ave., W. H. Settle & Co., $3,924.57; Ferdinand-ave., McCarthy, Bros., $2,794.

Syracuse, N. Y.—Alexander Baer was awarded the contract Nov. 7 for a 24-in. pipe sewer in Plum-st. and an 18-in. pipe sewer in N. Franklin-st. for $2,029.30.

Columbus, O.—The contract for building sewers in Maguire, North, Allen, W. Elm, N. Broad and Warner-sts. and Lenox-ave. was awarded Nov. 16 to Denallo & Kilingberg for $39,484.

Chicago, Ill.—Sewer contracts have been awarded as follows: Monroe-ave., between Sixtieth and Seventieth-sts., John H. McCarty, $17,000; Woodlawn-ave., between Thirty-third and Sixty-seventh-sts., Nash Bros., $11,000.

New Orleans, La.—The sewerage and water board has adopted a resolution accepting the bid of the Camden Iron Works, submitted Aug. 12, for furnishing pumping, steam and electrical equipment, for $246,500.

Petaluma, Cal.—(Special.)—N. S. Frost, Cy. Engr., says the contract for 1,220 ft. of 6-in. pipe sewer on Bremen and Madison-sts. was awarded Nov. 17 to H. C. Haughton at 48 cts. a ft. 3 manholes, $30 each.

Westfield, Mass.—Bids were received Nov. 5 for building section of the storm water sewer system as follows: R. D. Maynard, Springfield, $36,563; Bruno Solome & Petithe, Boston, $39,611; D. W. Mellen, Springfield, $41,443; Frank L. Allen, Worcester, $42,225; Rowe & Perini, So. Framingham, $43,104; D. J. Curtis, Springfield, $45,486; Geo. M. Atkins & Co., Palmer, $45,779; Michael Maloney, Springfield, $47,450.

Washington, D. C.—The Warren F. Brenizer Company, Fifteenth and G-sts., Washington, secured the contract Nov. 15 for constructing a portion of the low area trunk sewer in the District of Columbia for $73,665.

Providence, R. I.—Sewer contracts have been awarded as follows: 3,800 ft. 12-in. and 455 ft. 8-in. sewer, Fred Smith; 480 ft. 26-in. brick, 1,700 ft. 20-in. brick and 310 ft. 12-in. pipe sewer, Timothy F. Ryan.

Chicago, Ill.—John H. McCarthy was awarded the contract Nov. 11 for a sewer in Monroe-ave., between Sixtieth and Sixty-seventh-sts., for $17,000. Nash Bros. secured the contract for a sewer in Woodland-ave., between Sixty-third and Sixty-seventh-st., for $11,000.

Akron, O.—Sewer contracts have been awarded as follows: S. C. McGowan, Upson-st., $1,196.80; main trunk in district 9, $2,210.21; Hazel-st., $844.04; Buchtel-ave., $662.45; Wabash-ave., $752. Mike Kain, Edgewood-ave., $676.07. Frank McAlonan, State-st., $535.25. Ed McShaffrey, Chestnut-st., $6,791.92.

Buffalo, N. Y.—Bids for building a brick sewer in Mumford-ave. were received as follows: John Munn, $14,900; Dark & Co., $16,953; Miller, Franklin & Ritzmann, $15,600; McKeown & Johnson, $15,555; Beaser Bros., $17,112; James McElroy, $16,817. M. M. Betz & Co. submitted the lowest bid for building a 10-in tile sewer in Dutton-ave., at $2,676.

Roselle Park, N. J.—Bids were received Nov. 8 for building a sewerage system consisting of 5,900 ft. 15-in., 3,080 ft. 12-in., 4,120 ft. 10-in. and 32,870 ft. 8-in. pipe sewers, 140 manholes and 27 flush tanks, as follows: David Harper, Newark, $55,946; Union Bldg. & Constr. Company, Passaic, $51,542; Wm. McCloud & Co., Elizabeth, $58,362; J. Roosevelt Shanley, Jersey City, $51,640; Higginson & Shannon, Jersey City, $44,441.

WATER-WORKS.

Knoxville, Tenn.—A bill will be introduced in the next general assembly providing for this city to own its own water works plant.

Washington, Ind.—W. H. Kiefer, cy. clk., has notified the water works department that the residents will pay but one-half of the water rent on account of the unsanitary condition of the water.

Albany, N. Y.—Olin H. Landreth of Union university and Elnathan Sweet, former state engineer, have been appointed a committee to formulate the report of the water storage commission, which is to go to the legislature about the middle of January.

Hamilton, Ont.—The fire and water committee has passed resolutions recommending that after Dec. 31 the city council should charge the board of education, the separate school board, the public

parks, public library and cemetery board for water at the rate of 7½ cts. per 1,000 gallons.

Summit, N. J.—The Essex Union Water and Light Company of this city is constructing a new concrete standpipe which will have a capacity of 1,000,000 gallons. It will be fed from the Canoe Brook Station of the company and will give increased pressure to the supply in Millburn, South Orange, West Orange, Irvington and Vailsburg.

CONTEMPLATED WORK.

Sebring, O.—An increased water supply is proposed.

Terry, S. D.—The extension of the water works is proposed.

Geary, Ok. T.—Plans for a water works system are being prepared.

Monrovia, Cal.—The city council has decided to install meters.

Whittier, Cal.—The city contemplates issuing bonds for a new pump.

Renton, Wash.—Plans for a water works system have been adopted.

Bellaire, O.—Improvements at the pumping station are contemplated.

Youngstown, O.—The question of issuing $250,000 bonds will be voted on.

Watertown, S. D.—The question of purchasing the water works will be voted on.

Fairmount, W. Va.—A water main and a new reservoir will be built in the First ward.

Carthage, Mo.—The question of granting a water and gas franchise will be voted on Dec. 9.

Phoenix, Arix.—Cy. Engr. Farrish estimates the cost of a water works system at $270,000.

Hannibal, Mo.—The Hannibal Water Company will improve the plant at a cost of about $43,000.

Lansing, Ia.—A site for the pumping station of the water works system has been selected.

Lynchburg, Va.—A gravity system of water works is proposed, and bids will probably be asked soon.

Schenectady, N. Y.—A large number of water mains will be constructed. Alex Femirek, cy. clk.

Wilmington, Del.—Plans will be prepared at once for a reservoir and for filtering the water supply.

Sacramento, Cal.—Bids will be received Jan. 1 for $150,000 bonds to be used for extending the water mains.

Strathroy, Ont.—The question of purchasing the water works and electric light systems will be voted on.

Fairmont, W. Va.—The construction of a water main and a new reservoir in the First ward is contemplated.

Rich Hill, Mo.—The question of purchasing the water works system is being considered. Mayor Ferguson.

Brooklyn, N. Y.—The construction of two new pumping stations at Greenpoint at a cost of $48,000 has been authorized.

Foxcroft, Me.—The Dover and Foxcroft village fire corporation voted, Nov. 15, to purchase the water works system.

Pittsburg, Pa.—An ordinance has been passed appropriating $215,000 for water pipe extension in the downtown district.

Bessemer, Ala.—Definite plans will be completed soon for the proposed water works system. W. J. Parkes, city engineer.

Richmond, Va.—The water and furnace committee has recommended an issue of bonds for constructing a settling basin.

Quogue, L. I., N. Y.—Plans and estimates for improving the water works system are being prepared by C. O. McComb, city engineer.

Springfield, O.—The water works board is endeavoring to devise a plan for securing an adequate water supply for future use.

Memphis, Tenn.—The Artesian Water Company will replace all iron service pipes with lead pipes in the streets to be paved with asphalt.

Worcester, Mass.—Plans have been filed for a dam to be constructed on the site of the Mann reservoir, on Kettle Brook, in Leicester.

Haydenville, Mass.—The Joseph Wright brook is being considered as a possible source of water supply for this place and Williamsburg.

St. Louis, Mo.—The water committee of the B. P. I. has decided to not use alum as a coagulent for purifying the water supply of this city.

Waterbury, Conn.—The property-owners have petitioned for a high service supply of potable water. The installation of meters is proposed.

Marietta, O.—The construction of a new main from the pumping station on the Ohio river to the new settling reservoirs is contemplated.

New Britain, Conn.—The construction of a new reservoir in Wolcott Mountain next year is contemplated. Thomas S. Hall, chmn. water bd.

Atlantic City, N. J.—The water commissioners are considering the advisability of building a filtration plant at the main plant near Absecon.

Aylmer, Ont.—This city contemplates improving and extending the water works system. Bids will be asked for two filters. J. Bradley, town clk.

The question of issuing water works bonds will be voted on at the following places: Walsenburg, Col., Dec. 9; Merced, Cal.; Lawrenceburg, Tenn.

Meridian, Miss.—Bids are asked until Dec. 4 for plans and for building water works, according to press reports. A. W. Washburn, chmn. water com.

Milwaukee, Wis.—This city contemplates the installation of a new 20,000,000 gal. engine and the construction of a pumping station during the next year.

Cienfuegos, Cuba—H. J. Reilly of New York City has been engaged to draw plans and specifications for the construction of a water works system

North Hempstead, L. I., N. Y.—Bids will probably be asked soon for furnishing not less than 40 fire hydrants for the Great Neck water supply district.

The question of issuing water works bonds has been favorably voted on as follows: Primghar, Ia; Cedar City, Utah; Danville, Ky.; Arcadia, Wis.; Meeteetse, Wyo.; Lewis, Ia.

Walsenburg, Col.—An ordinance has

been introduced calling for a special election on the question of issuing $60,000 bonds for the purchase and improvement of the water works system.

Joliet, Ill.—Mayor Barr has devised a plan for the construction of a new water works reservoir at a cost not to exceed the appropriation of $10,000, according to press reports.

Atlanta, Ga.—A bill has been passed by the house of representatives providing for an election on the issue of $800,000 bonds for the improvement of the water works and sewerage systems.

Syracuse, N. Y.—The establishment of a new water system and the laying of new water mains throughout the state fair grounds and the placing of new hydrants at a cost of $12,000 has been decided upon.

Ottumwa, Ia.—Bids will be received soon for about 470 tons of 6 to 16-in. c. i. pipe, 19,000 lbs. specials and for laying pipe, etc., for the proposed new water works system. J. T. Brady, cy. engr.

Milwaukee, Wis.—Cy. Engr. Poetsch is planning to carry 7 conduits across the river at different points, as soon as the deepening of the river makes it necessary to lower the present water mains.

The construction of water works systems is contemplated at the following places: Turin, Ia.; Crete, Ill.; Ripley, Mich.; Duncan, Ind. Ter.; Pascagoula, Miss.; Cameron, Mo.; Tocco, Ga.; Washtucna, Wash.

Humansville, Mo.—Dr. Fred Mitchell, O. J. McLane, cy treasurer, and Dr. Ammerman of the city council, visited Clinton, Nov. 10 to inspect the water works system and secure information regarding pressure, reservoirs, stand pipes, etc.

Kansas City, Mo.—This city has retained Hiram Phillips of St. Louis, Mo., as consulting engineer in the proposed improvement of the water works system. The question of issuing $250,000 bonds for the improvement will probably be voted on. An ordinance has been passed appropriating $10,000 for the purchase of pipe to be used in extending water mains in the residence district.

CONTRACTS TO BE LET.

Gillett, Wis.—Bids are asked until Dec. 29 for constructing a water works system. L. B. Studke, vil. clk.

Louisville, Ky.—Sealed bids are asked until Dec. 20 for pumping engines, boilers and furnaces. Charles R. Long, prest. Louisville Water Company.

Meridian, Wis.—Plans and bids are asked for until Dec. 4 for constructing water works. A. W. Washburn, chmn. council water com.

Ardmore, I. T.—Bids are asked until Dec. 18 for constructing a water works system. Chester B. Davis, 10 Wall-st., New York City, cons. engr.

Boston, Mass.—Sealed bids are asked until 2:30 p. m. Dec. 4 for stripping 970,000 cu. yds. of surface soil from 7,000 acres of the Wachusetts reservoir and depositing it in the shallow portion of the reservoir at Oakdale and in the embankment of a road across the reservoir at West Boylston. The work includes 135,000 cu. yds. of earth excavation, 15,000 cu. yds. of rock excavation, 1,200 cu. yds. of Portland cement concrete masonry in a dam to be built across the Quinepoxet river, and 23,500 cu. yds. stone paving on the slopes of embankments and elsewhere. Wm. N. Davenport, secy. Met. Water and Sewerage bd.

CONTRACTS AWARDED.

Lawton, Ok. T.—The water works contract was awarded Nov. 15 to Cook & Son of Junction City, Kas., for $104,958.90.

Rankin, Pa.—The contract for 2,000 ft. of water pipe was awarded to the McKeesport Construction Co. for over $3,000.

Mallard, Ia.—The contract for water works was awarded to the Des Moines Bridge and Iron Works of Des Moines for $6,500.

Gadsen, Ala.—R. A. Mitchell and associates have been granted the right to build and operate a water works system in this city.

Oneida, N. Y.—The contract for extending the water mains was awarded to Fitch & Thompson of this city for $343.20.

Bellingham, Minn.—The contract for a tower and tank was awarded to the United States Wind Engine Pump Co. of Batavia, Ill., for $2,750.

Fremont, O.—The contract for installing a new air lift plant at the water works was awarded to the Shaw-Kendall Company of Toledo for $9,800.

Tampico, Mex.—The contract for building water works and sewerage systems has been awarded to Jas. P. McDonald of Knoxville, Tenn., according to press reports, for about $2,000,000.

Pittsburg, Pa.—An ordinance has been passed granting permission to the Pennsylvania Water Company to extend its Wilkinsburg and Swissvale mains within the limits of this city.

Moline, Ill.—(Special.) The contract for building a concrete reservoir, filter beds and well has been awarded to the Tri-City Construction Company of Davenport, Ia. The contract for a high duty pump was awarded to the Holly Manufacturing Company for $24,300.

Brockton, Mass.—Bids were received Nov. 8 for a pumping engine for the Silver lake extension to the water works as follows: Allis-Chalmers Company, Milwaukee, $68,000 and $64,000; R. D. Wood & Co., Philadelphia, $62,000; Snow Steam Pump Company, Buffalo, $45,095; Holly Manufacturing Company, Lockport, N. Y., $43,800; Barr Pumping Engine Company, Philadelphia, $43,500; Kilby Manufacturing Company, Cleveland, $40,800; Holly Manufacturing Company, Lockport, N. Y., $35,200.

BRIDGES.

Tacoma, Wash.—An iron bridge across the gulch adjacent to the city reservoir is contemplated.

Georgetown, Col.—Bids are asked until Dec. 15 for a steel bridge over Clear creek near the mouth of Gilson gulch, below Idaho springs. H. O. Walker, co. clk.

Douglas, Wyo.—Plans will be made for a steel bridge across North Platte river at Center-st.

Nampa, Idaho—The citizens of Canyon county voted to issue $39,980 for building three bridges.

Jasper, Ind.—Sealed bids are asked until 1 p. m. Dec. 2 for building two iron bridges. Bd. co. comrs.

Mauston, Wis.—This town voted Nov. 4 to build a bridge across Lemonweir river. R. S. Joslin, cy. clk.

Duryea, Pa.—A bridge across Lackawanna river at this place has been recommended by the grand jury.

Sioux Falls, S. D.—A 70-ft. steel bridge has been authorized over the north end of Covell's lake.

Milwaukee, Wis.—A resolution was passed Nov. 17 to issue $100,000 bonds for the Washington-ave. viaduct.

Hazlehurst, Ill.—The question of issuing $1,600 bonds for bridge and road purposes will be voted on.

Gardenplain, Ill.—An appropriation of $3,000 has been voted for building a wagon bridge across Redfern creek.

Rockford, Ill.—A three-span bridge across Turtle creek, at South Beloit, is contemplated by the bd. of suprs.

Sacramento, Cal.—Bids will probably be asked for a concrete and for a steel bridge across Alder Creek, near Folsom.

Boston, Mass.—William Jackson, city engineer, estimates the cost of building a bridge at Woodsworth-st., East Boston, at $4,500.

Detroit, Mich.—The question of issuing $600,000 bonds for building the Belle Isle bridge has been favorably voted on.

Peoria, Ill.—A resolution has been submitted to council providing for replacing the low free bridge with a new structure.

Huntington, Ind.—A resolution has been adopted by council appropriating $8,160 for a new bridge across the Wabash river at Andrews.

Fort Winnebago, Wis.—The town supervisors have asked for an appropriation of $1,000 to aid in building a bridge over French Creek.

Dayton, O.—Plans for two bridges over Miami river at Third-st. and Stratford-ave. are being prepared by Frank M. Turner, city engineer.

Santa Barbara, Cal.—The city engineer has been directed to prepare plans and estimates for bridges to replace old wooden structures.

Unionville, Wis.—Bids are asked until Dec. 2 for building a steel bridge across Shoal Creek, Lincoln township. G. W. Dickson, bridge commissioner.

Lawrenceburg, Ky.—The contract for building the abutments for a bridge across Hammond's Creek has been awarded to Landon C. Gunter for $400.

Danville, Ill.—Council has adopted a resolution providing that the city pay one-third the cost of a new bridge to connect Vermillion Heights with the city.

Milwaukee, Wis.—Sealed bids are asked until Dec. 18 for constructing a concrete superstructure or breakwater and North Harbor pier. J. G. Warren, major engrs.

Osceola, Mo.—Bids are asked until Dec. 3 for constructing stone piers for the bridge over Big Monegan, on the Taberville and Monegan road. W. A. Ingram, co. road and bridge comr.

Chicago, Ill.—Sealed bids are asked until Dec. 17 for erecting the superstructure of a bridge across the Chicago river. Thomas B. Smyth, prest. bd. trustees of sanitary dist.

Washington, Ind.—The contract for building a bridge over the west fork of White river, joining Davies and Knox counties, was awarded to the Indiana Bridge Company of Muncie for $13,664.

Seneca Falls, N. Y.—The question of issuing bonds for building the Rumsey-st. bridge and for repairing and maintaining the Bridge-st. and Seneca-st. bridges will be voted on Nov. 25.

Woonsocket, R. I.—City Engineer Mills estimates the cost of building a new arch bridge over Black Stone river on S. Main-st. at $36,300. An ordinance has been passed appropriating this amount.

Tallahassee, Fla.—Leon and Gadsden counties have decided to build a bridge across the Ocklockonee river, near Jackson bluff, and a committee has been authorized to employ a civil engineer to prepare plans.

Springfield, Mass.—Judge E. F. Lyford, Nathan D. Bill and Everett E. Stone have been appointed members of a special commission to investigate the question of a new bridge over the Connecticut river.

STREET LIGHTING.

Frankfort, Ill.—Better lights for the streets are urged.

Wauwatosa, Wis.—Plans are being prepared for an electric plant.

Linneus, Mo.—This town voted Nov. 10 to issue bonds for an electric light plant.

Waterloo, Ia.—The council will secure estimates for an electric light and gas system.

Hot Springs, Ark.—Bids are asked until Dec. 5 for lighting this city. Sam Hamblin, cy. engr.

Kensington, Md.—Newman Little, cy. clk., has been directed to purchase a number of new street lamps.

York, Pa.—A plan to establish a municipal light plant is being devised by the council light committee.

St. Louis, Mo.—A bill has passed providing for the establishment of a municipal lighting plant.

Villa Rica, Ga.—A company has been organized to build an electric light plant. Chas. M. Griffin, prest.

West Seneca, N. Y.—The town board voted to contract with the Buffalo General Electric Company for electric lighting.

Rome, Ga.—Bids are asked until Jan. 15 for an electric light plant, according to press reports. J. D. Hanks, mayor.

North Amherst, O.—Bids are asked until Dec. 2 for installing an electric light plant. F. E. Kaser, cy. clk.

Manila, P. I.—Competitive bids will be received March 4, 1903, for a street railway, light and power franchise. Clarence R. Edwards, Col. U. S. Army, Ch. of Bureau of Insular Affairs, Washington, D. C.

Kansas City, Mo.—Ordinances have been approved for the erection of 45 arc street lights, 100 gas and 6 gasoline lamps.

Springfield, O.—A franchise has been granted the Citizens' Heating and Power Company to construct and operate a heating and power system.

Holyoke, Mass.—An ordinance was passed Nov. 18 authorizing the issue of $720,000 bonds to purchase municipal lighting plants.

Brooklyn, Ia.—The council is considering a proposition by the Mason City Gas and Fuel Company to install a gasoline lighting system in this city.

Binghamton, N. Y.—A committee will be appointed to consider the question of installing a heating and lighting plant for the county buildings

Marshalltown, Ia.—A resolution is pending providing for a special election to vote on the question of issuing bonds for a municipal gas and electric light plant.

West Hartford, Conn.—This town has voted to appropriate $2,000 for lighting certain streets. Chas. C. Cook is member of a committee to investigate the kinds of lighting.

St. Paul, Minn.—Sealed bids are asked for until 5 p. m., Dec. 2, for lighting certain streets and public grounds with gas, gasoline and electricity. Matt Jensen, cy. clk.

Erie, Pa.—The contract for electric lighting for five years was awarded to the Edison Electric Light & Power Company at 16 cts. per lamp per night or $58.40 per lamp per year.

St. Paul, Minn.—Sealed bids are asked until 5 p. m., Dec 2, for lighting certain streets and public buildings by gas, gasoline or electricity during 1903. Matt Jensen, cy. clk.

Hot Springs, Ark.—Bids are asked until 3 p. m., Dec. 5, for lighting this city with electric light for a term of years not exceeding ten years. Geo. R. Belding, prest. bd. pub. affairs.

Philadelphia, Pa.—Bids are asked until Dec. 20 for furnishing engines, generators, boilers, etc., for a complete electrical power plant for the Frankford Arsenal. Frank Heath, commanding.

Cleveland, O.—The finance committee of the city council, consisting of Councilmen Biesiger, Howe and Reynolds, is considering the advisability of recommending the establishment of a municipal electric lighting plant.

Norfolk, Va.—Bids are asked until Dec. 4 for furnishing a generator, engine, switchboard, boiler and chloride accumulator elements for an electric plant at Ft. Monroe, Engineer's office, U. S. army, room 2 Custom house.

Detroit, Mich.—The contract for an 800 h.p. engine was awarded to the Bradley Mfg. Company of Pittsburg, Pa., for $14,600 for the 600 K. W. alternator and exciter to the Stanley Electric Company of Pittsfield, Mass., for $8,900.

The construction of electric light plants is contemplated at the following places: Louisa, Ky.; Hinsdale, Mass.; Boonville, N. Y.; Pascagoula, Miss.; Sweetwater, Tex., Brooklyn, Ia.; Bartlow, Fla. Cheraw, S. C.

Canton, O.—(Special.)—W. E. Keplinger, prest. of the Metropolitan Paving Brick Company, says that company is in the market for an electric apparatus to operate about ¾ mi. of tram road. The company also contemplates lighting two of its plants by electricity.

McMinnville, Tenn.—Chas. H. Fisk of Detroit, has purchased the falls of Caney Fork, 12 mls. south of this place, and contemplates the erection of a large plant for the generation of power to be transmitted to Nashville and other points.

Covington, Ky.—Bids were received Nov. 12 for lighting the streets and alleys as follows: Union Light, Heat and Power Company, electric arc lights of 2,000 c. p., $75 per lamp per annum; 1,200 c. p., $65 per lamp; incandescent lamps, $2 per month. Sun Vapor Light Company, Canton, O., gasoline lights, $19 to $25 per lamp according to power.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Seattle, Wash.—The board of health recommends the construction of a crematory for disposing of this city's garbage.

St. Paul, Minn.—A resolution was approved Nov. 13 authorizing the city engr. to expend $40,000 for street sprinkling.

Reading, Pa.—The contract for erecting a garbage plant for the Reading Sanitary Reduction Company was awarded to Geo. W. Beard & Co.

Des Moines, Ia.—A resolution has been filed asking the American Underwriting Company to submit a proposition for handling the garbage of this city.

Kansas City, Mo.—Bids will be received Dec. 19 for collecting and disposing of this city's garbage. Dr. Langsdale, cy. physician.

New York City.—Wm. Bradley, 534 W. Forty-eighth-st., was the only bidder Nov. 21 for the removal of snow and ice in Manhattan borough, at 30 cts. a cu. yd.

Sandusky, O.—Wm. F. Sietz, jr., represents a branch of the Waste Utilization Company of New Jersey, which proposes to erect a garbage disposal plant in this city.

PARKS.

Linneus, Mo.—The city voted Nov. 10 to improve a city park.

Des Moines, Ia.—The park board will add 30 acres to Grand View park.

Crookston, Minn.—The city council has accepted a plat of Highland Park addition for a public park.

Chattanooga, Tenn.—An ordinance has been introduced authorizing the purchase of property for a park in South Chattanooga.

Wilmington, Del.—The park commission has recommended the purchase of 24 acres of land north of the Brandywine for park extension.

Orange, N. J.—The New England society of the Oranges has indorsed the project to issue $1,000,000 more bonds to be devoted to parkway improvements.

Chicago, Ill.—C. H. Claussen, prest. of the Gage Park Improvement association, has appointed a committee to confer with the South Side park commissioners regarding the improvement of the park system in the vicinity of Gage park.

Oakland, Cal.—Plans and specifications for improving the proposed park south of Lake Merritt, between Eighth and Twelfth-sts. have been filed by the city engineer, who estimates the cost of the improvement at $145,000.

FIRE APPARATUS.

Dallastown, Pa.—The purchase of a fire engine is contemplated.

Linneus, Mo.—This voted Nov. 10 to purchase a fire engine.

Austin, Minn.—The purchase of 500 ft. of fire hose has been authorized.

Laporte, Ind.—Council has approved the proposed purchase of 600 ft. of new hose.

Erie, Pa.—Councils have been asked for authority to purchase 2,500 ft. of hose. Chief McMahon has been authorized to purchase a turret nozzle.

Spokane, Wash.—The city com. has decided to furnish the hose companies four rubber coats. Mayor Stuberauch.

Waterloo, Ia.—The city council has authorized the purchase of 1,600 ft. of new fire hose, the purchase to be made as soon as possible. Mayor Martin.

TOO LATE FOR CLASSIFICATION

Wichita, Kas.—A system of storm sewers is proposed.

West Duluth, Minn.—A petition will be circulated for paving Fifty-fifth-ave.

Quanah, Tex.—The construction of a water works plant is contemplated. J. L. Elbert, mayor.

Canaan, Conn.—Sealed bids are asked until 2 p. m., Dec. 3, for grading a section of road. Walter J. Kellogg, chmn. selectmen.

Loveland, Col.—The contract for 10,000 ft. of sewers was awarded Nov. 18 to Dunnigan & Palmer of Shenandoah, Ia., for about $11,000.

Chicago, Ill.—A bill will be submitted to council providing for municipal ownership of street railways, gas and electric light plants.

New Britain, Conn.—The water commissioners have voted to construct a new reservoir on Wolcott mountain, in Southington, at a cost of $75,000.

Milwaukee, Wis.—This city will build a new viaduct across the Menominee valley from First-ave. on the South Side to Sixth-st. on the West Side at a cost of about $550,000.

Jeffersonville, Ind.—The United States Gas & Electric Company notified the council Nov. 20 that a contract does not exist for lighting this city and if one is not made before Dec. 2 this city will be without lights. The city contends that a contract does exist.

Seattle, Wash.—The Coast Concrete Company was awarded a contract Nov. 16 for building concrete sidewalks on Eleventh-ave. N. and Kinnear-place, for $2,681.25.

Milwaukee, Wis.—Sealed bids are asked until Dec. 5 for constructing section 4 of the Kinnickinnic river flushing tunnel. Chas J. Poetsch, chmn. comrs. pub. wks.

Erie, Pa.—The contract for building a 9-in. sewer in Sixteenth-st. was awarded to Dennis O'Brien at 98 cts. for 9-in. pipe, 40 cts. for 6-in. pipe and $39 for manholes.

New Orleans, La.—The cy. engr. was directed, Nov. 18, to advertise for bids for repaving St. Charles-st., from Canal to the Circle, and Toulouse-st., from Rampart to Chartres.

Kewanee, Ill.—The Kewanee Lighting and Heating Co. has been organized and incorporated and will enlarge the plat of the Light & Power Co., add a new engine, dynamo and boiler house.

Hartford, Conn.—The city engineer was authorized Nov. 19 to employ Roscoe N. Clark to make a map of the intercepting sewer. This sewer, it is learned, was not built in many respects as originally planned.

Mound City, Ill.—Sealed bids are asked until Dec. 18 for constructing a wooden bridge on Government road, between this city, National Cemetery and Mounds, Ill. Lieut.-Col. J. W. Jacobs, Dept. Q. M., St. Louis, Mo.

Louisville, Ky.—Ordinances were passed Nov. 18 for improving Shipp-ave., G. Floyd, Clay and Ash-sts. and two alleys. Ordinances are pending for paving the sidewalks on certain streets and improving O-st.

St. Louis, Mo.—Ordinances for paving were approved Nov. 21 as follows: Asphalt, Washington-ave., from Third to Twelfth-st.; brick, Pennsylvania, Walton, Blair, Labadie, McNair and Evans aves. and Cleary and Bissell-sts.

Ballard, Wash.—Only one bid was submitted Nov. 18 for the proposed soft water main along Salmon bay, and that was from the Pacific Coast Pipe Company, for $6,684.40. The bid was higher than the estimates, and action on it was deferred.

Pueblo, Col.—Contracts for the proposed standpipe in Fairmont park and 3 mis. of piping to connect it with the water mains were awarded Nov. 18 as follows: Standpipe, Iron City Manufacturing Company, $69,000; piping, Holm & Allen of Denver, $31,000.

Columbus, Ind.—The city council directed, Nov. 20, that bids will be asked for repairing the asphalt pavements. Also, that suit be instituted against the Ayres Asphalt Paving Company, Zanesville, O., for failure to keep its guarantee good by making the necessary repairs.

Greenville, O.—Ordinances were passed Nov. 18 for improving Walker-st. from Washington-ave. to Gray-ave.; Gray-ave. from Walker to Sater-st.; Pine-st. from Gray to Washington-ave.; to use stone cement or vitrified brick in construction or repair of sidewalks within the city limits.

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PUBLISHED BY
MUNICIPAL ENGINEERING CO.
INDIANAPOLIS.
NEW YORK OFFICE, 1 BROADWAY.
WILLIAM FORTUNE, *President.*
CHARLES CARROLL BROWN, M. AM. SOC. C. E., *Editor.*
M. F. TANSY, *News Editor.*
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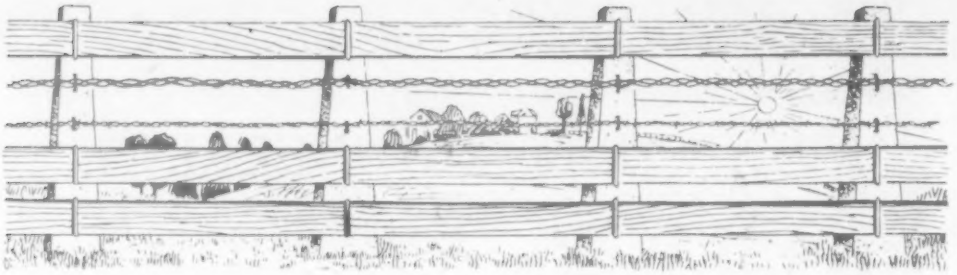
Entered at Post-Office, Indianapolis, Ind., as Second-Class Mail Matter.



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Abner Acetylene Gas Co., Chicago, Ill.

Architects.

Thos. H. Moxley, Greenfield, Ind.

Artificial Stone Pavements.

Acme Paving Co., Columbus, O.
H. G. Coldwell, Indianapolis, Ind.
John Lipps, Cincinnati, O.
Ohio Stone Paving Co., Youngstown, O.
Rogers & Dunlop, Indianapolis, Ind.

Asphalt.

Alcatraz Asphalt Co., San Francisco.
American Asphalt Association, St. Louis, Mo.
American Contracting Co., Ltd., Buffalo, N. Y.
Ayers Asphalt Paving Co., Zanesville, O.
H. & A. B. Aveline Sicilian Rock Asphalt Co,. Catania, Italy (postage 5 cents).
The Barber Asphalt Paving Co., New York City.
T. Hugh Boorman, New York, N. Y.
Densmore Stabler Refining Co., Los Angeles, Cal.
Joseph J. Duffy & Co., Chicago, Ill.
Gabriel & Schall, New York City.
Globe Asphalt Co., Pittsburg, Pa.
Otto E. C. Guelich, Detroit, Mich.
Hercules Oil Refining Co., Los Angeles, Cal.
Jewett & Blodgett Oil Co., Bakersfield, Cal.
North American Paving Co., Chicago, Ill.
Charles W. Saacke, New York City.
W. S. P. Shields, Philadelphia, Pa.
The Sicilian Asphalt Paving Co., New York.
Southern Refining Co.. Los Angeles, Cal.
Trinidad Asphalt Mfg. Co., St. Louis, Mo.
Union Oil Co., San Francisco, Cal.
Uvalde Asphalt Co., New York City.
Warren Asphalt Paving Co., Utica, N. Y.
Western Paving and Supply Co., Indianapolis, Ind.

Asphalt (Brunswick) Importers.

Gabriel & Schall, New York City.

Asphalt Blocks.

Lake Erie Asphalt Block Co., Toledo, O.
New Castle Asphalt Block Co., Pittsburg, Pa.
North American Paving Co., Chicago, Ill.

Asphalt Machinery.

Drake Standard Machine Works, Chicago, Ill.
Iroquois Iron Works, Buffalo, N. Y.
Robert Hooke, Chattanooga, Tenn.
Julian Scholl & Co., New York City.
Toledo Asphalt Patcher Co., Toledo, O.

Asphalt Mixers.

Erie Machine Shop, Erie, Pa.
Iroquois Iron Works, Buffalo, N. Y.
Toledo Asphalt Patcher Co., Toledo, O.

Asphalt Pavements.

Alcatraz Asphalt Co., San Francisco, Cal.
American Contracting Co., Ltd., Buffalo, N. Y.
Ayers Asphalt Paving Co., Zanesville, O.
Barber Asphalt Paving Co., New York.
R. F. Conway Co., Chicago, Ill.
Thomas L. Dooley, Chicago, Ill.
Joseph J. Duffy & Co., Chicago, Ill.
J. U. Fritchey, Lancaster, Pa.
Gilsonite Construction Co., St. Louis, Mo.
Otto E. C. Guelich, Detroit, Mich.
F. H. Kirchner & Co., Cincinnati, O.
John Lipps, Cincinnati, O.
Nelson Paving Co., Waco, Tex.
New Castle Asphalt Block Co., Pittsburg, Pa.
North American Paving Co., Chicago, Ill.
Charles W. Saacke, New York, N. Y.
Schillinger Bros. Co., Toledo, O.
W. S. P. Shields, Philadelphia, Pa.
The Sicilian Asphalt Paving Co., New York.
Trinidad Asphalt Mfg. Co., St. Louis, Mo.
Warren Asphalt Paving Co., Utica, N. Y.
Warren Bros. Co., Boston, Mass.
Western Construction Co., Lafayette, Ind.
Western Paving & Supply Co., Indianapolis, Ind.

Asphalt Plants.

Erie Machine Shop, Erie, Pa.
Iroquois Iron Works, Buffalo, N. Y.
Toledo Asphalt Patcher Co., Toledo, O.

Asphalt Railroad Plants.

Iroquois Iron Works, Buffalo, N. Y.
Toledo Asphalt Patcher Co., Toledo, O.

Asphalt Repair Plant.

Robert Hooke, Chattanooga, Tenn.
Toledo Asphalt Patcher Co., Toledo, O.

Asphalt Sidewalks.

Warren Bros. Co., Boston, Mass.

Asphalt Tanks.

W. B. Scaife & Sons, Pittsburg, Pa.

Asphalt Tools.

W. H. Anderson & Sons, Detroit, Mich.
Contractors' Tool Company, Philadelphia, Pa.
F. H. Crafts, Rochester, N. Y.
Iroquois Iron Works, Buffalo, N. Y.
Orr & Lockett Hardware Co., Chicago, Ill.
Julian Scholl & Co., New York City.
Toledo Asphalt Patcher Co., Toledo, O.

Belting.

Queen City Supply Co., Cincinnati, O.

Bitulithic Pavements.

The Central Bitulithic Paving Co., Zanesville, O.
Hoosier Construction Co., Indianapolis, Ind.
Warren Bros. Co., Boston, Mass.
Warren Bros. Co., Philadelphia, Pa.

Bituminous Macadam.

The Central Bitulithic Paving Co., Zanesville, O.
Hoosier Construction Co., Indianapolis, Ind.
Warren Bros. Co., Boston, Mass.
Warren Bros. Co., Philadelphia, Pa.

Blue Print Copying Machines.

Pittsburg Blue Print Co., Pittsburg, Pa.

Blue Print Paper.

The H. Cole Co., Columbus, O.
Pittsburg Blue Print Co., Pittsburg, Pa.

Boilers.

Marinette Iron Works, Marinette, Wis.
W. B. Scaife & Sons, Pittsburg, Pa.

Bolting Screens.

Jeffrey Mfg. Co., Columbus, O.

Bridges.

Concrete Steel Engineering Co., New York City.
Wm. Fife & Son, Indianapolis, Ind.
Hollensbe Stone Co., Westport, Ind.
Wm. B. Scaife & Sons Co., Pittsburg, Pa.

Cars.

Niles Mine & Mill Supply Co., Cleveland, O.

Castings.

Hennessy Foundry Company, Springfield, O.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.

Catch Basin Manufacturers.

Byram Foundry Co., Indianapolis, Ind.
Greger Mfg. Co., Philadelphia, Pa.
Kramer Bros., Dayton, O.
H. W. McDonald & Son, Galion, O.

Cement.

Alpha Portland Cement Co., Alpha, N. J.
Alsen's Portland Cement Works, New York.
Atlas Portland Cement Co., New York City.
F. Behrend, New York City.
Brier Hill Coal & Iron Co., Youngstown, O.
Buckeye Portland Cement Co., Bellefontaine, O.
Cayuga Lake Cement Co., Ithaca, N. Y.
Commercial Wood and Cement Co., Philadelphia.
H. J. Conkling, Cincinnati, O.
Detroit Portland Cement Co., Detroit, Mich.
Ellis-Blum Co., Meadville, Pa.
Empire Portland Cement Co., Warner, N. Y.
Gabriel & Schall, New York City.
Glens Falls Portland Cement Co., Glens Falls, N. Y.
W. G. Hartranft Cement Company, Philadelphia, Pa.
Houston Bros., Pittsburg, Pa.
Illinois Steel Co., Chicago, Ill.
Kelley Island Lime and Transport Co., Cleveland, O.
D. J. Kennedy, Pittsburg, Pa.
Lawrence Cement Co., New York City.
Lehigh Portland Cement Co., Allentown, Pa.
Lesley & Trinkle, Philadelphia, Pa.
Meacham & Wright, Chicago, Ill.
Michigan Alkali Company, Wyandotte, Mich.
Milwaukee Cement Co., Milwaukee, Wis.
New Jersey Portland Cement Co., Perth Amboy, N. J.

Omega Portland Cement Co., Jonesville, Mich.
Peninsular Portland Cement Co., Jackson, Mich.
T. W. Spinks, Covington, Ky.
Schaeffer & Gengnagel, Dayton, O.
Standard Silica Cement Co., New York City.
Vulcanite Portland Cement Company, Philadelphia Pa.
Wabash Portland Cement Co., Detroit, Mich.
Charles Warner & Co., New York.
J. L. Van Natta & Co., Lafayette, Ind.

Cement Construction.

W. W. Benson, Terre Haute, Ind.
Beardstown Concrete Construction Co., Beardstown, Ill.
Thos. C. Farrell, Washington, N. J.
Stevens Cast Stone Co., Chicago, Ill.

Cement Machinery.

C. O. Bartlett & Co., Cleveland, O.
The Bonnot Co., Canton, O.
Chambers Bros. Co., Philadelphia, Pa.
Cleveland Car Co., Cleveland, O.
Dodge Manufacturing Company, Mishawaka, Ind.
W. D. Dunning, Syracuse, N. Y.
S. Howes Co., Silver Creek, N. Y.
Jeffrey Mfg. Co., Columbus, O.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.
Kent Mill Co., New York.
Merchant & Co., Philadelphia, Pa.
Ransome & Smith, Brooklyn, N. Y.

Cement Packers.

S. Howes Co., Silver Creek, N. Y.

Cement Pans.

W. B. Scaife & Sons Co., Pittsburg, Pa.

Cement Paving.

American Art Tile Co., Columbus, Ohio.
Thos. L. Dooley, Chicago, Ill.
Gilsonite Construction Co., St. Louis, Mo.
Ohio Stone and Paving Company, Youngstown, O.
Rogers & Dunlop, Indianapolis, Ind.
M. C. Russell Cement Paving Co., Springfield, O.
W. H. Settle & Co., Cincinnati, O.

Cement Tools.

W. H. Anderson & Sons, Detroit, Mich.
Contractors' Tool Co., Philadelphia, Pa.
F. H. Crafts, Rochester, N. Y.
Orr & Lockett Hardware Co., Chicago, Ill.

Centrifugal Pumps.

Irvin Van Wie, Syracuse, N. Y.

Chemical Tests.

Booth, Garrett & Blair, Philadelphia, Pa.
Hassan, Tagge & Dean, Detroit, Mich.
Lathbury & Spackman, Philadelphia, Pa.
Pittsburg Testing Laboratory, Pittsburg, Pa.

Civil Engineers.

C. C. Brown, Indianapolis, Ind.
Mason L. Brown, Detroit, Mich.
W. H. Bryan, St. Louis, Mo.
F. W. Cappelen, Minneapolis, Minn.
B. H. Colby, St. Louis, Mo.
John A. Cole & Son, Chicago, Ill.
Downey & Wilcox, Anderson, Ind.
John B. Duncklee, New York, N. Y.
John P. Force, Columbus, O.
Howard Egleston, Havana, Cuba.
Gordon Engineering & Construction Co., Cincinnati, O.
C. G. H. Goss, Martinsville, Ind.
John J. Hainsworth, Indianapolis, Ind.
Hassan, Tagge & Dean, Detroit, Mich.
Hering & Fuller, New York, N. Y.
Ingram & Leftwich, Nashville, Tenn.
Iowa Engineering Co., Clinton, Iowa.
Jeup, Moore & Minor, Indianapolis, Ind.
John Lorentz, Hamilton, Ohio.
M. W. Kingsley, Cleveland, O.
Chester R. McFarland, Cleveland, O.
R. E. McMath Surveying Co., St. Louis, Mo.
Dabney H. Maury, Peoria, Ill.
The Municipal Engineering Co. (Inc.), New York City.
George S. Pierson, Kalamazoo, Mich.
Ohio Engineering Company, Elyria, O.
Clement L. Reamer, Newark, O.
Walter P. Rice Engineering Co., Cleveland, O.
Andrew Rosewater, Omaha, Neb.
S. Bent Russell, St. Louis, Mo.
Shedd & Sarle, Providence, R. I.
W. S. Shields, Chicago, Ill.
Snow & Barbour, Columbus, O.
J. B. Stuart, Pittsburg, Pa.
R. H. Tingley, Providence, R. I.
Walter R. Toy, Lima, O.
M. Tschirgi, Jr., Dubuque, Iowa.
Wardle & Yeager, Cedar Rapids, Iowa.
Waring, Chapman & Farquhar, New York, N. Y.
Edgar Williams, Chicago, Ill.
Wise & Watson, Passaic, N. J.
Frank W. Wood, Chicago, Ill.

Clay-Working Machinery.

The Bonnot Co., Canton, O.
Chambers Bros. Co., Philadelphia, Pa.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.

Clay Products.

American Clay Mfg. Co. of N. J., Pittsburg, Pa.
H. J. Conkling, Cincinnati, O.
Ferris Brick Co., Mechanicsville, N. Y.
Reese-Hammond Fire Brick Co., Bolivar, Pa.

Coal and Coke.

Pittsburg & Buffalo Co., Pittsburg, Pa.
Schaeffer & Gengnagel, Dayton, O.

Coal Tar.

T. F. McClure & Sons Co., Cincinnati, O.
E. B. Warren & Co., Washington, D. C.
Warren Bros. Co., Boston, Mass.
Warren Bros. Co., Philadelphia, Pa.

Combined Curb and Gutter.

Acme Paving Co., Columbus, O.
D. C. Buntin, Indianapolis, Ind.
H. A. Lensing, Evansville, Ind.
Harry C. McKay, Cincinnati, O.
M. C. Russell Cement Paving Co., Springfield, O.
W. H. Settle & Co., Cincinnati, O.
Warren Bros. Co., Boston, Mass.

Concrete Mixers.

A. B. Black, Concord, N. H.
Chambers Bros Co., Philadelphia, Pa.
Contracters Plant Co., Boston, Mass.
J. H. Day & Co., Cincinnati, O.
Drake Standard Machine Works, Chicago, Ill.
W. D. Dunning, Syracuse, N. Y.
Fisher & Saxton Co., Washington, D. C.
Jeffrey Mfg. Co., Columbus, O.
Julian Scholl & Co., New York City.

Concrete Steel Arch Bridges.

Concrete Steel Engineering Co., New York City.

Concrete Work.

James W. Ball, Wyncote, Pa.
W. W. Benson, Terre Haute, Ind.
Beardstown Concrete Construction Co., Beardstown, Ill.
S. W. Coombs & Son, Cedar Falls, Ia.
Thos. L. Dooley, Chicago, Ill.
Erimus Construction Company, Indianapolis, Ind.
Thos. C. Farrell, Washington, N. J.
J. G. Hutchinson, Hamilton, O.
H. A. Lensing, Evansville, Ind.
John A. McGarry & Co., Chicago, Ills.
Stevens Cast Stone Co., Chicago, Ill.
Warren Bros. Co., Boston, Mass.

Contractors.

Acme Paving Co., Columbus, O.
American Art Tile Co., Columbus, Ohio.
James W. Ball, Wyncote, Pa.
Thos. Bridges' Sons, Wabash, Ind.
D. C. Buntin, Indianapolis, Ind.
The Central Bitulithic Paving Co., Zanesville, O.
City Wastes Disposal Co., New York City.
Cleveland Silex Stone Co., Detroit, Mich.
R. F. Conway Co., Chicago, Ill.
H. G. Coldwell, Indianapolis, Ind.
Thos. L. Dooley, Chicago, Ill.
Joseph J. Duffy & Co., Chicago, Ill.
Wm. Fife & Son, Indianapolis, Ind.
Fielding & Shepley, St. Paul, Minn.
Jas. P. Graham, Brooklyn, N. Y.
Otto E. C. Guelich, Detroit, Mich.
J. U. Fritchey, Lancaster, Pa.
Gilsonite Construction Co., St. Louis, Mo.
Gordon Engineering and Construction Co., Cincinnati, O.
J. H. Green & Son, Appleton, Wis.

Hoosier Construction Co., Indianapolis, Ind.
J. G. Hutchinson, Hamilton, O.
Ingram & Leftwich, Nashville, Tenn.
F. H. Kirchner & Co., Cincinnati, Ohio.
H A. Lensing, Evansville, Ind.
John Lipps, Cincinnati, O.
John A. McGarry & Co., Chicago, Ill.
Harry C. McKay, Cincinnati, O.
J. H. Marden Cement Paving Co., La Crosse, Wis.
Nashville Roofing & Paving Co., Nashville, Tenn.
Nelson Paving Co., Waco, Tex.
North American Paving Co., Chicago, Ill.
A. G. Pugh, Columbus, O.
E. K. Roberts & Co., Detroit, Mich.
Rogers & Dunlop, Indianapolis, Ind.
M. C. Russell Cement Paving Co., Springfield, O.
Schillinger Bros. Co., Toledo, O.
C. J. Selvage, Louisville, Ky.
B. M. & J. F. Shanley, Philadelphia, Pa.
W. H. Settle & Co., Cincinnati, O.
Smith, Moss & Brown, Chicago, Ill.
Standard Paving Co., Newark, N. J.
Troy Public Works Co., Utica, N. Y.
Chas. H. Warford & Co , Dayton, O.
Wright & Childers, Grammer, Ind.

Contractors and Builders.

Erimus Construction Company, Indianapolis, Ind.
J. G. Hutchinson, Hamilton, O.

Contractors' Supplies.

H. J. Conkling, Cincinnati, O.
Ellis-Blum Co., Meadville, Pa.
Queen City Supply Co., Cincinnati, O.
Schaeffer & Gengnagel, Dayton, O.
Chas. H. Warford & Co., Dayton, O.
E. B. Warren & Co., Washington, D. C.

Contractors' Wagons.

Studebaker Bros. Mfg. Co., South Bend, Ind.
D. S. Watson, Canastota, N. Y.

Contractors' Tools and Machinery.

Acme Road Machinery Co., Frankfort, N. Y.
W. H. Anderson & Sons, Detroit, Mich.
Austin & Western Co., Ltd., Chicago, Ill.
Contractors' Plant Co., Boston, Mass.
F. H. Crafts, Rochester, N. Y.
Queen City Supply Co., Cincinnati, O.
A. B. Black, Concord, N. H.
Contractors' Tool Company, Philadelphia, Pa.
Orr & Lockett Hardware Co., Chicago, Ill.
Julian Scholl & Co., New York City.
Syracuse Chilled Plow Co., Syracuse, N. Y.
Wiard Plow Co., Batavia, N. Y.

Conveyors.

C. O. Bartlett & Co., Cleveland, O.
Carson Trench Machine Co., Boston, Mass.
Dodge Manufacturing Company, Mishawaka, Ind.
The Jeffrey Mfg. Co , Columbus, O.
Niles Mine and Mill Supply Co., Niles, O.
Syracuse Chilled Plow Company, Syracuse, N. Y.

Corrugated Iron and Steel.

Niles Mine & Mill Supply Co., Cleveland, O.
W. B. Scaife & Sons Co., Pittsburg, Pa.

Creosoted Wood Block.

Hoosier Construction Co., Indianapolis, Ind.
Republic Chemical and Creosoting Co., Indianapolis, Ind.
Terre Haute Creosoting Co., Terre Haute, Ind.

Crushers, Rock and Ore.

Austin & Western Co., Ltd., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
Julian Scholl & Co., New York City.
Kent Mill Co., New York.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.

Crushed Stone.

Thos. Bridges' Sons, Wabash, Ind.
Cleveland Stone Co., Chicago, Ill.

Culvert Pipe, Vitrified.

American Clay Mfg. Co. of N. J., Pittsburg, Pa.
Buckeye Fire Clay Co., Uhrichsville, O.
H. J. Conkling, Cincinnati, O.
Evens & Howard, St. Louis, Mo.
Houston Bros., Pittsburg, Pa.
Mecca Clay Works, Mecca, Parke Co., Ind.
Michigan Sewer Pipe Co., Jackson, Mich.
Monmouth Mining and Mfg. Co., Monmouth, Ill.
Royal Sewer Pipe & Fire Brick Co., Akron, O.
H. Stevens' Sons Co., Macon, Ga.
U. S. Clay Mfg. Co., Griffin, Ill.
Thos. L. Dooley, Chicago, Ill.

Curbing.

James W. Ball, Wyncote, Pa.
D. C. Buntin, Indianapolis, Ind.
Cleveland Stone Company, Cleveland, O.
Jas. P. Graham, Brooklyn, N. Y.
Hollensbe Stone Co., Westport, Ind.
H. A. Lensing, Evansville, Ind.
Harry C. McKay, Cincinnati, O.
Ohio Stone and Paving Co., Youngstown, O.
Rogers & Dunlop, Indianapolis, Ind.
W. H. Settle & Co., Cincinnati, O.
Warren Bros. Co., Boston, Mass.

Derricks.

Queen City Supply Co., Cincinnati, O.

Drain Tile.

H. J. Conkling, Cincinnati, O.
Houston Bros., Pittsburg, Pa.
D. J. Kennedy, Pittsburg, Pa.
Michigan Sewer Pipe Co., Jackson, Mich.
Royal Sewer Pipe & Fire Brick Co., Akron, O.

Drawing Papers.

Pittsburg Blue Print Co., Pittsburg, Pa.

Dryers.

Cleveland Car Co., Cleveland, O.
J. H. Day & Co., Cincinnati, O.
Iroquois Iron Works, Buffalo, N. Y.

Dump Cars.

Niles Mine & Mill Supply Co., Cleveland, O.

Dumps.

Cleveland Car Co., Cleveland, O.

Dump Wagons.

Studebaker Bros. Mfg. Co., South Bend, Ind.
United States Sanitary Co., Washington, D. C.
Watson Wagon Co., Canastota, N. Y.

Electrical Supplies.

W. Grant Thorpe, Newburgh, N. Y.

Electrolytic Investigations.

Dabney H. Maury, Peoria, Ill.

Engines, Portable and Stationary.

Marinette Iron Works, Marinette, Wis.
Queen City Supply Co., Cincinnati, O.

Filtration Plant.

Wm. B. Scaife & Sons Co., Pittsburg, Pa.

Feed Water Plants.

Wm. B. Scaife & Sons Co., Pittsburg, Pa.

Fire Alarms.

Gamewell Fire Alarm Telegraph Co., New York City.

Fire Brick.

American Clay Mfg. Co. of N. J., Pittsburg, Pa.
Clearfield Clay Working Co., Clearfield, Pa.
H. J. Conkling, Cincinnati, O.
Evens & Howard, St. Louis, Mo.
Kentucky Fire Brick Co., Portsmouth, O.
Michigan Sewer Pipe Co., Jackson, Mich.
Reese-Hammond Fire Brick Co., Bolivar, Pa.
Royal Sewer Pipe & Fire Brick Co., Akron, O.
H. Stevens' Sons Co., Macon, Ga.

Fire Clay Products.

American Clay Mfg. Co. of N. J., Pittsburg, Pa.
Buckeye Fire Clay Co., Uhrichsville, O.
Clearfield Clay Working Co., Clearfield, Pa.
H. J. Conkling, Cincinnati, O.
Evens & Howard, St. Louis, Mo.
Ferris Brick Co., Mechanicsville, N. Y.
Kentucky Fire Brick Co., Portsmouth, O.
Mecca Clay Works, Mecca, Parke Co., Ind.
Michigan Sewer Pipe Co., Jackson, Mich.
Monmouth Mining and Mfg. Co., Monmouth, Ill.
Reese-Hammond Fire Brick Co., Bolivar, Pa.
The Royal Sewer Pipe & Fire Brick Co., Akron, O.
H. Stevens' Sons Co., Macon, Ga.
J. L. Van Natta & Co., Lafayette, Ind.

Fire Wagons.

Robert Hooke, Chattanooga, Tenn.

Flagging.

Cleveland Stone Co., Cleveland, O.
Hollensbe Stone Co., Westport, Ind.

BUSINESS DIRECTORY—CONTINUED.

Flint Pebbles.
John D. McGlincey, New York, N. Y.

Flue Liners.
American Clay Mfg. Co. of N. J., Pittsburg, Pa.
H. J. Conkling, Cincinnati, O.
Royal Sewer Pipe & Fire Brick Co., Akron, O.

Flush Tanks.
Pacific Flush Tank Co., Chicago, Ill.

Garbage Carts.
United States Sanitary Co., Washington, D. C.

Garbage Disposal Plants.
City Wastes Disposal Co., New York City.
The Municipal Engineering Co. (Inc.), New York City.

Gas Engines.
August Mietz, New York City.

Granite.
T. F. McClure & Sons Co., Cincinnati, O.

Hoisters.
W. H. Anderson & Sons, Detroit, Mich.
C. O. Bartlett & Co., Cleveland, O.
Carson Trench Machine Co., Boston, Mass.
Potter Mfg. Co., Indianapolis, Ind.

Hollow Block Machinery.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.

Hose Coupling.
The W. J. Clark Co., Salem, O.

Hydraulic Cement.
H. J. Conkling, Cincinnati, O.
Meacham & Wright, Chicago, Ill.
Milwaukee Cement Co., Milwaukee, Wis.

Hydraulic Rams.
Power Specialty Co., New York.

Incandescent Lamps.
General Incandescent Lamp Co., Cleveland, O.
W. Grant Thorpe, Newburgh, N. Y.

Iron Paving Block.
American Street Railway Paving & Improvement Co., Springfield, Mass.

Kerosene Engines.
August Mietz, New York City.

Lamps, Electric.
General Incandescent Lamp Co., Cleveland, O.

Lamps, Gas and Gasoline.
Brilliant Gas Lamp Co., Chicago, Ill.
Cleveland Vapor Light Co., Cleveland, O.
Reserve Foundry & Mfg. Co., Cleveland, O.

Landscape Engineers.
Mason L. Brown, Detroit, Mich.

Lawn Mowers.
Clipper Lawn Mower Co., Norristown, Pa.

Lime.
H. J. Conkling, Cincinnati, O.
A. H. Lauman, Pittsburg, Pa.

Locomotives.
H. K. Porter Co., Pittsburg, Pa.

Macadam and Concrete Stone.
B. M. & J. F. Shanley, Philadelphia, Pa.

Macadamizing.
James W. Ball, Wyncote, Pa.
James P. Graham Brooklyn, N. Y.
Troy Public Works Co., Utica, N. Y.
Warren Bros. Co., Boston, Mass.
Wright & Childers, Grammer, Ind.

Marbleithic Flooring.
The Marbleithic Co., Dayton, O.

Mechanical Engineers.
W. H. Bryan, St. Louis, Mo.
Dabney H. Maury, Peoria, Ill.

Municipal Fire Alarms.
Gamewell Fire Alarm Telegraph Co., New York City.

Municipal Lighting.
Abner Acetylene Gas Co., Chicago, Ill.
Brilliant Gas Lamp Co., Chicago, Ill.
Cleveland Vapor Light Co., Cleveland, O.
John Lorenz, Hamilton, Ohio.
Reserve Foundry & Mfg. Co., Cleveland, O.

Paving Blocks.
Clinton Paving and Building Brick Company, Clinton, Ind.
Kentucky Fire Brick Co., Portsmouth, O.
Metropolitan Paving Brick Co., Canton, O.
Purington Paving Brick Co., Galesburg, Ill.
Roseville Brick and Terra Cotta Co., Roseville, O.
Saginaw Clay Mfg. Co., Saginaw, E. S., Mich.
Springfield Paving Brick Co., Springfield, Ill.

Paving Brick.
American Clay Mfg. Co. of N. J., Pittsburg, Pa.
Clearfield Clay Working Co., Clearfield, Pa.
Clinton Paving and Building Brick Co., Clinton, Ind.
W. S. Dickey Clay Mfg. Co., Kansas City, Mo.
Ferris Brick Co., Mechanicsville, N. Y.
Galesburg Paving Brick Company, Galesburg, Ill.
Kentucky Fire Brick Co., Portsmouth, O.
T. F. McClure & Sons Co., Cincinnati, O.
Metropolitan Paving Brick Co., Canton, O.
Moore, E. H., Chicago, Ill.
Pittsburg & Buffalo Co., Pittsburg, Pa.
Purington Paving Brick Co., Galesburg, Ill.
Reese-Hammond Fire Brick Co., Bolivar, Pa.
Roseville Brick and Terra Cotta Co., Roseville, O.
Saginaw Clay Mfg. Co., Saginaw, E. S., Mich.
Sangamo Brick Company, Springfield, Ill.
Scranton Vitrified Brick and Tile Company, Scranton, Pa.
Springfield Paving Brick Co., Springfield, Ill.
Wabash Clay Mfg. Co., Veedersburg, Ind.

Paving Brick Machinery.
Chambers Bros. Co., Philadelphia, Pa.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.

Paving, Cement Sidewalk.
H. G. Coldwell, Indianapolis, Ind.
S. W. Coombs & Son, Cedar Falls, Ia.
Thos. L. Dooley, Chicago, Ill.
Ohio Stone & Paving Co., Youngstown, O.
Rogers & Dunlop, Indianapolis, Ind.
C. J. Selvage, Louisville, Ky.

Paving Contractors.
James W. Ball, Wyncote, Pa.
The Central Bitulithic Paving Co., Zanesville, O.
Cleveland Silex Stone Co., Detroit, Mich.
H. G. Coldwell, Indianapolis, Ind.
R. F. Conway Co., Chicago, Ill.
Thos. L. Dooley, Chicago, Ill.
Joseph J. Duffy & Co., Chicago, Ill.
Jas. P. Graham, Brooklyn, N. Y.
Fielding & Shepley, St. Paul, Minn.
J. U. Fritchey, Lancaster, Pa.
Gilsonite Construction Co., St. Louis, Mo.
J. H. Green & Son, Appleton, Wis.
Hoosier Construction Co., Indianapolis, Ind.
Ingram & Leftwich, Nashville, Tenn.
F. H. Kirchner & Co., Cincinnati, O.
Lake Erie Asphalt Block Co., Toledo, O.
W. H. Luchtenberg, Columbus, O.
J. H. Marden Cement Paving Co., La Crosse, Wis.
John A. McGarry & Co., Chicago, Ill.
Nashville Roofing & Paving Co., Nashville, Tenn.
Nelson Paving Co., Waco, Tex.
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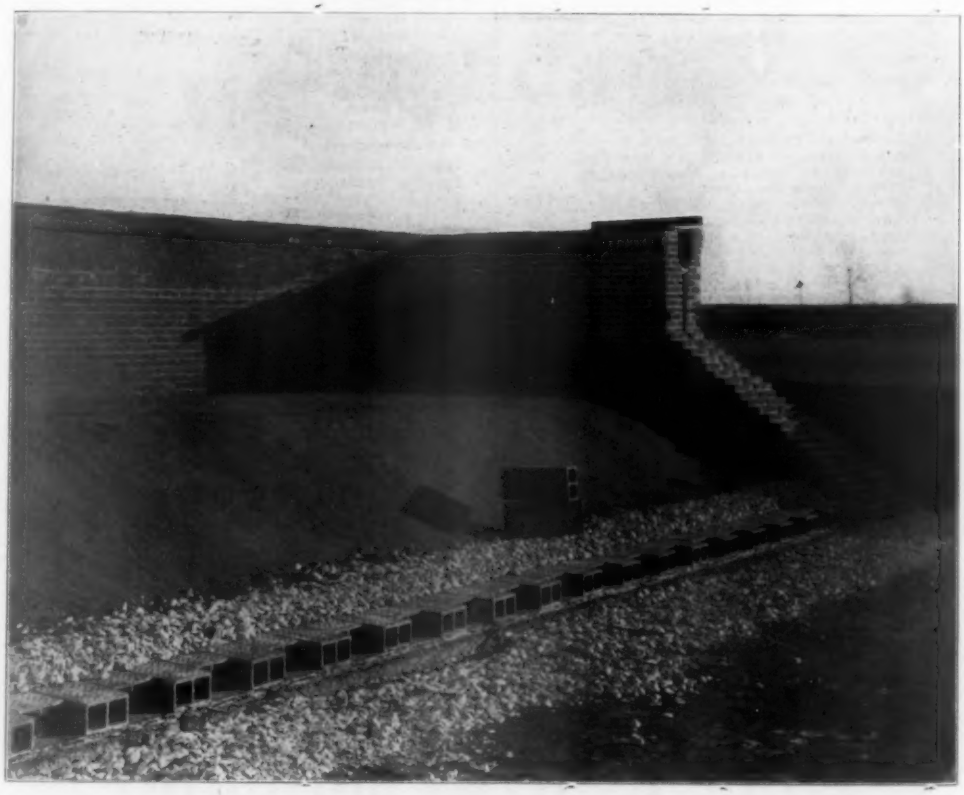

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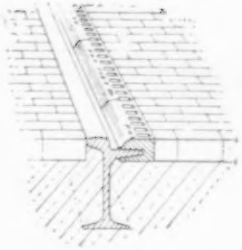

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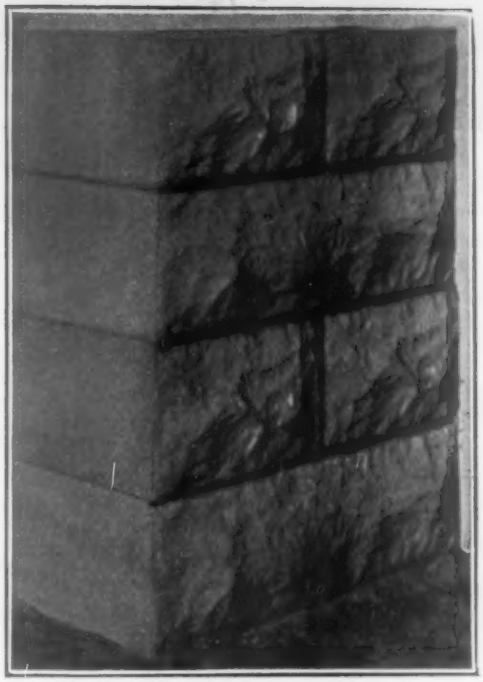

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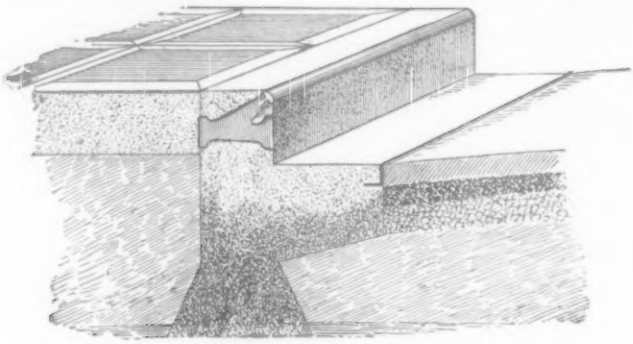

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The cut on opposite page illustrates the general appearance and advantages of the **Wainwright Steel-Bound Concrete Curb,** as constructed in accordance **with the printed directions and the Patents of this Company.**

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Ordinary Cement Curbing, and the cheaper grades of stone used, require constant renewing and repairs. Stone curbs, from various causes, shift their positions and become "out of line." The alignment of the **Wainwright Steel-Bound Curb** is perfect, and it **Will Stay Exactly as Placed.**

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The cut shows an ideal plan for sidewalks, curb, gutter and street pavements, but particular attention is called to the curb, with its edge protected by a galvanized curved bar, with a dovetailed web or tongue extending into the concrete, giving **Perfect Protection.** The galvanized surface conforms in color to the concrete, giving a harmonious effect, free from stain or discoloration.

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The price of this Curb, finished and in place, varies according to conditions, and when laid, **Requires No Resetting or Repairs,** while the results attained are greatly superior to those of any Curbing ever laid. Years of severe testing and practical use, to extent of hundreds of thousands of feet, without an instance of failure, have fully demonstrated the fact that the **Wainwright Steel-Bound Concrete Curb** is not only of practical use, but a pronounced financial success.

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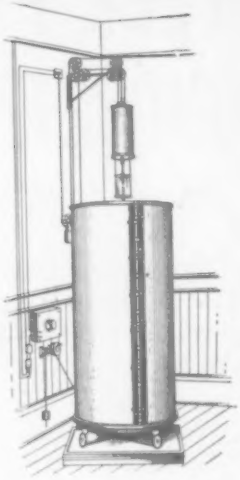

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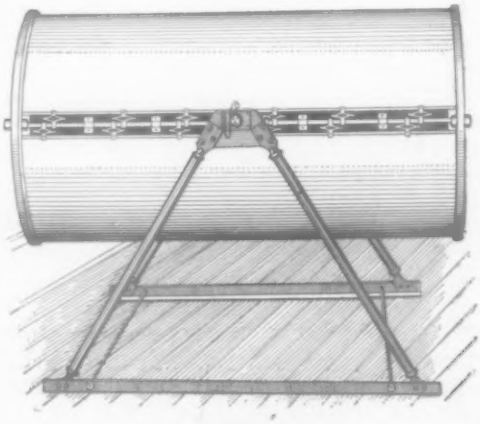

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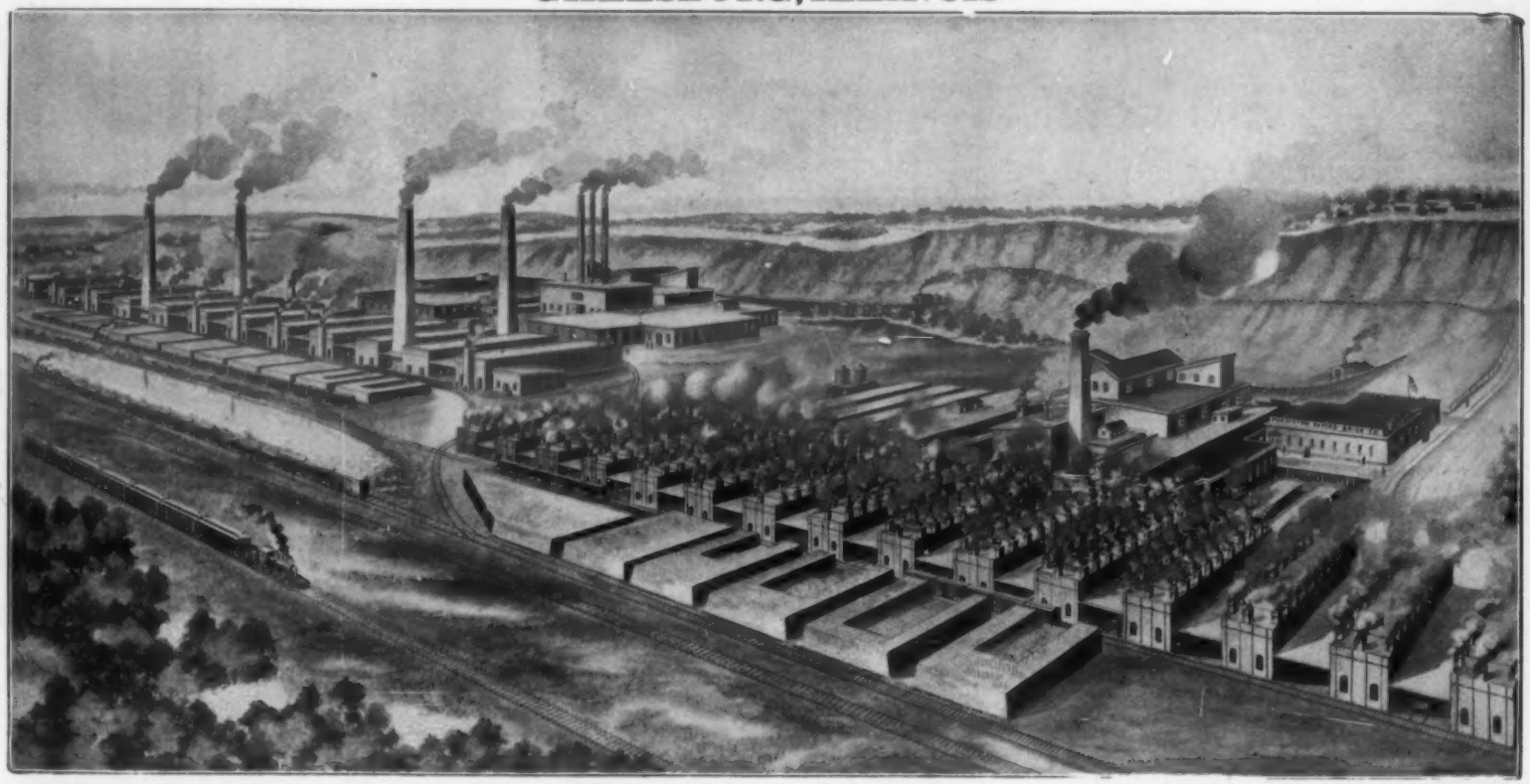

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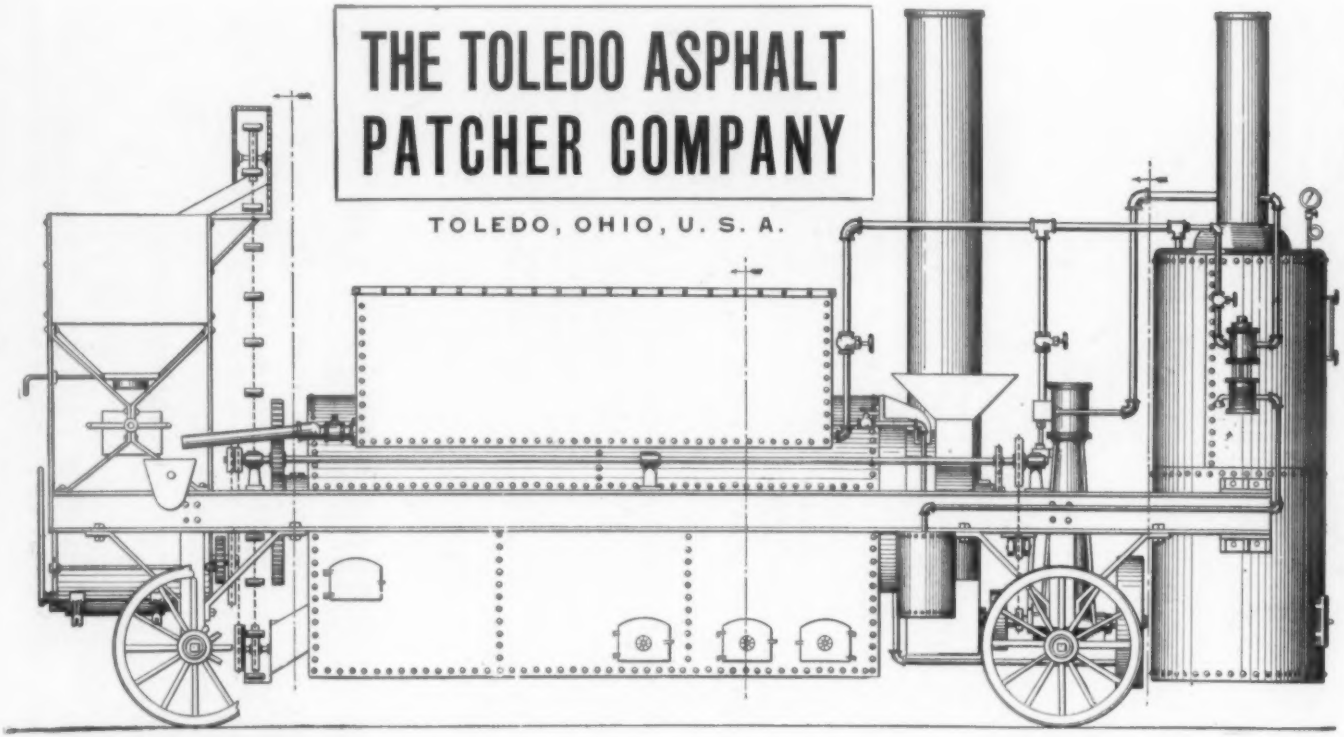
TOLEDO, OHIO, U. S. A.



The Modern Asphalt Plant Is Now Ready For the Market Write for Circular

THE PATCHER

The Modern Asphalt Plant is now ready for the market.

Asphalt and Bituminous Macadam Paving Companies owning one of these machines will find the maintenance of pavements reduced to a minimum. The Toledo Asphalt Patcher Co. is an organization of Asphalt Experts, and in designing this machine, special attention has been given to the parts which years of experience have taught as most important. Never has there been an asphalt plant on four wheels equal to the capacity of **The Patcher.** So extremely portable, that it can be drawn by one team of horses through streets and alleys and turn corners with as much ease as with an ordinary dray.

To Municipalities—**The Patcher** especially appeals. In cities with 25,000 yards of asphalt or over, this machine will pay for itself in a short time. One experienced man and two helpers are all that will be needed to operate it.

Do not think because we call this great machine **The Patcher**, that it is only intended for repair work. For Parks, Sidewalks and Cellars it stands alone. Why pay an enormous price for a plant, trackage, cartage, watchmen, etc., when two of these machines are equal to the same, and cost less, to say nothing of labor saved.

Give us your order. Our expert will set your mixture, and see you properly started. For furtner particulars address

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Civil Engineers, Surveyors, Assistants and Inspectors in the Various Branches of Municipal Engineering, Draughtsmen, Superintendents of Paving Brick Plants Foremen for Contractors,

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POSITION WANTED.—Water-Works Engineer, graduated from European school, 33 years of age, desires position either as chief or first assistant in large water-works. Familiar with every class of modern instruments and pumping machinery; expert on artesian wells and pneumatic pumping systems. Ten years' practical experience; seven years in this country. G. B. 33, care MUNICIPAL ENGINEERING CO.

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FOR SALE.—Mr John A. McDowell, of Columbus, Ohio, has a Cement Testing Machine and a fine Chemical Balance for sale. Write him.

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A System of Bench Marks.

We would use marble blocks, 5 inches square, set firmly in solid earth or concrete, the top flush with grade line. *Have elevations recorded* in books specially prepared with headings, rulings and plates for diagrams and topographical delineations. One hundred markers suffice for six miles of streets. Future grading, curbing, and *sewering may be determined*, the rights of the people and corporations defined and adjusted. Any corporation can have a proposal for this work. Address, B. F. HATHEWAY, C. E., Stamford, Conn.

SEWERS.

Sealed proposals will be received at the office of the Clerk of the Board of Control, No. 105 City Hall, until 12 o'clock M., July 10, 1902, for the construction of a main intercepting sewer in Lake street, between Water street and Muirson street.

Plans and specifications may be seen and blank praposals can be obtained at the office of the Chief Engineer.

Each proposal must contain the full name of the party or parties making the same, and all persons interested therein, and must be accompanied by a certified check for fifteen thousand ($15,000) dollars, payable to the Director of Public Works, on a solvent bank in the city, as surety that if the proposal be accepted a contract will be entered into.

No proposals will be entertained unless made on blanks furnished by the Chief Engineer and delivered at the office of the Clerk of the Board of Control, No. 105, City Hall, previous to 12 o'clock M., on the day specified.

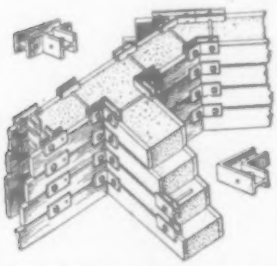
The city reserves the right to reject any or all bids.

CHARLES P. SALEN,
Director of Public Works.

Cleveland, Ohio, June 11, 1902.

FOR SALE.—Second-hand Wrought-Iron Pipe, sizes 1 to 4 in., for sale cheap. Manufacturers and dealers in Steam and Gas Engines, Boilers, Tanks, Oil Well Supplies, etc. E. R. YOUNG & SONS, Titusville, Pa. Branch office, 511 Washington Street, Marion, Ind.

COMBINED BOX-CAP AND SHOE-PLANK HOLDERS



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BIDS FOR CONSTRUCTION OF SIDEWALK AND CURB.

Sealed bids are asked until July 12, 1902, for the construction of 36,000 square feet of cement sidewalk and 4,000 linear feet of cement curbing for the village of Red Jacket, Houghton county, Michigan.

For plans and specifications apply to William W. Stockly, City Engineer, Hancock, Michigan.

The Village Council reserves the right to reject any or all bids.

WANTED IMMEDIATELY.—An assistant in the engineering department, familiar with sewer, pavement and general street improvement work; able to act as inspector or foreman. Would prefer good draftsman. State age, married or single, experience, references, salary expected, and send sample of drafting. Address BRIGGS REAL ESTATE COMPANY, Peoria, Ill.

NOTICE TO MACADAM ROAD CONTRACTORS.

Notice is hereby given that the undersigned Board of Commissioners of Morgan county, state of Indiana, invites and will receive sealed bids at the Auditor's office of said county until 2 o'clock P. M., July 7, 1902, for the construction of a macadamized road in Ashland township of said county, according to the plans, specifications and profiles now on file in said Auditor's office.

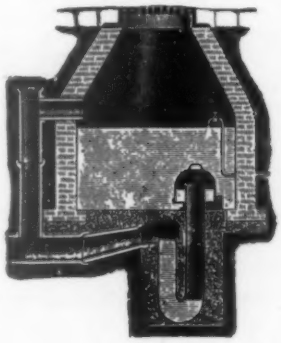
Bid must be accompanied with good and sufficient bond, either freehold or surety company, in an amount equal to twice the amount of the bid.

The Board reserves the right to reject any and all bids.

Witness our hands and seal of the Commissioners' court this 9th day of June, 1902.

OSCAR ROBBINS,
WM. A. SHULER,
J. M. BLAIR,
Commissioners.

Attest:
J. S. WHITAKER, Auditor Morgan County.



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For FLUSHING STREET SEWERS AND FOR SUB-SOIL IRRIGATION.....

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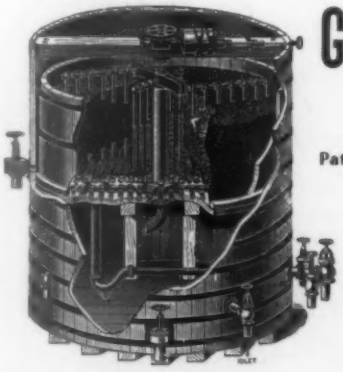

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Suitable for Cement Works, Quarries, Contractors' Service, etc.

36 inches guage 2 locomotive, 12½-ton saddle tank style.
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1 locomotive, 23 -ton saddle tank style.
56½ inches gauge 1 locomotive, four driving wheels, 20 tons weight with 8 wheel tender.

They are all new machines, just completed, ready for immediate delivery. For detailed description and prices (bona fide intending users only),

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HAS FOUR ENAMELED STEEL SIGNS
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Indestructible Except by Violence.
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The "Ad" Was Very Satisfactory

CITY CLERK'S OFFICE,
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MUNICIPAL ENGINEERING CO.

Gentlemen—Please find herewith express money order in payment of your invoice March 1, 1902, for drinting street paving notice. Also want to say that this "ad" was very satisfactory.

C. B. WEAVER, City Clerk.

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STANDARD
ALARM AND SIGNAL TELEGRAPHS
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is as bad as none. And no fire department is as efficient as it should be unless

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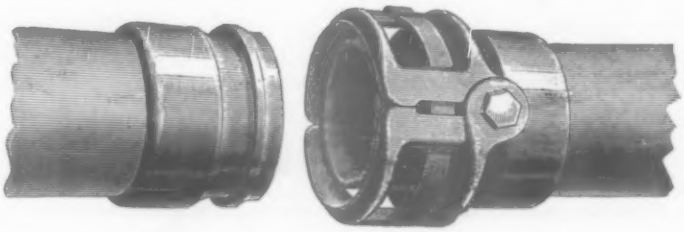

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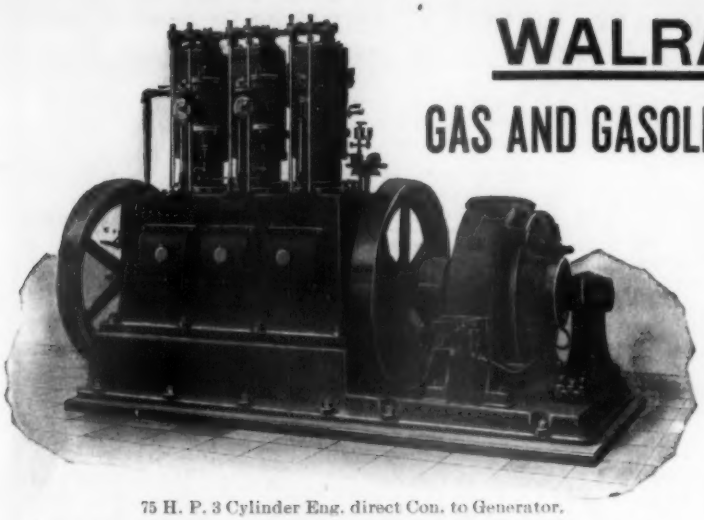

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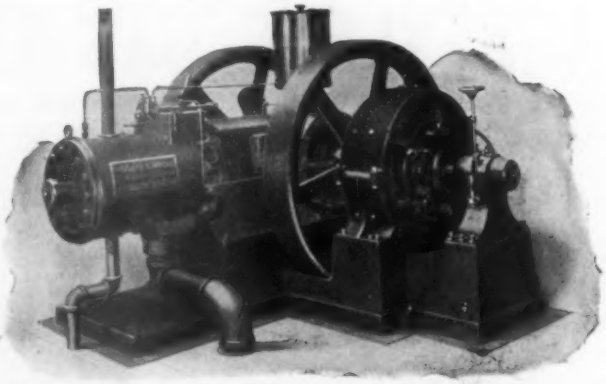
The Mietz and Weiss Gas and KEROSENE Engine



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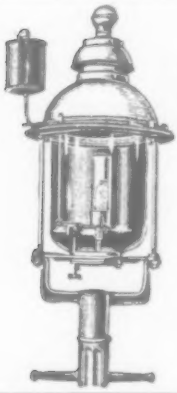

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This is the lamp that the tank requires filling once a week.

This is the fixture that should be on the streets as a saving proposition to any city.

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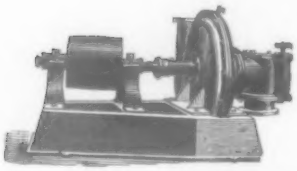

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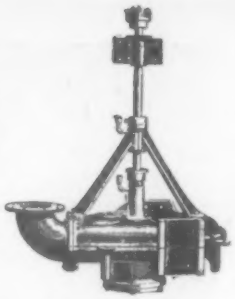
TRIPLEX PUMP



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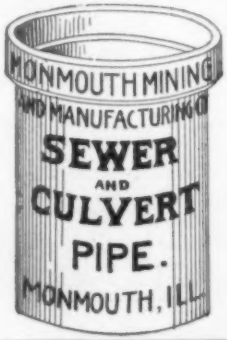

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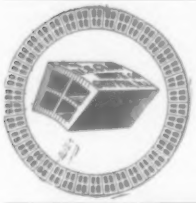

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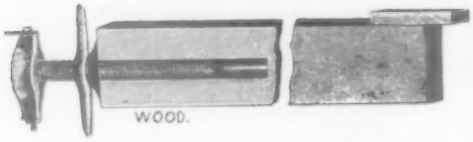

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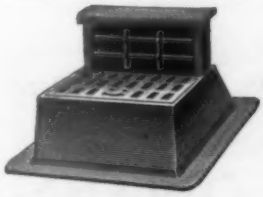

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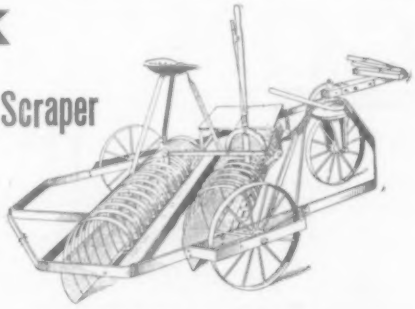

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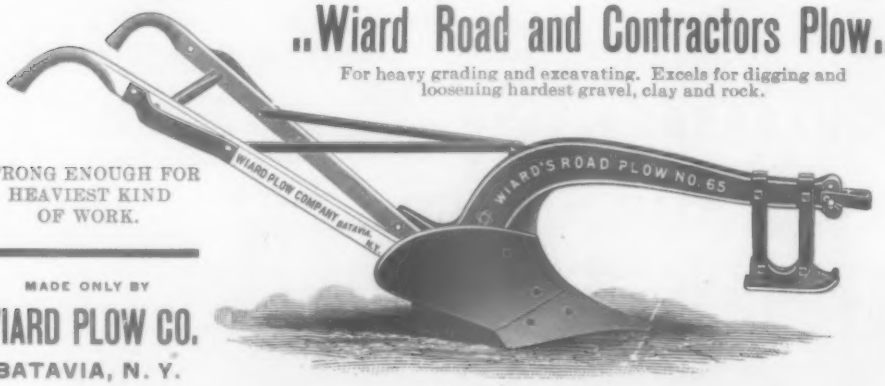

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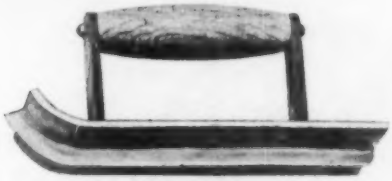

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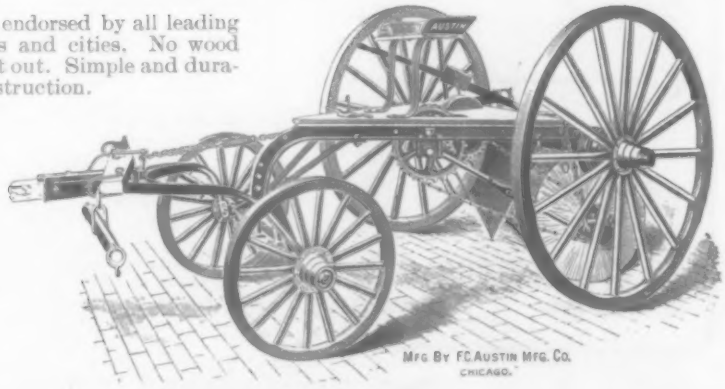

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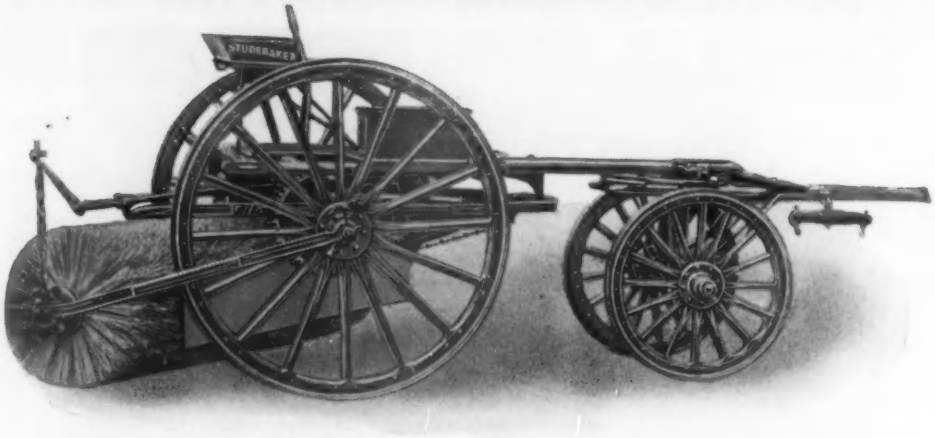

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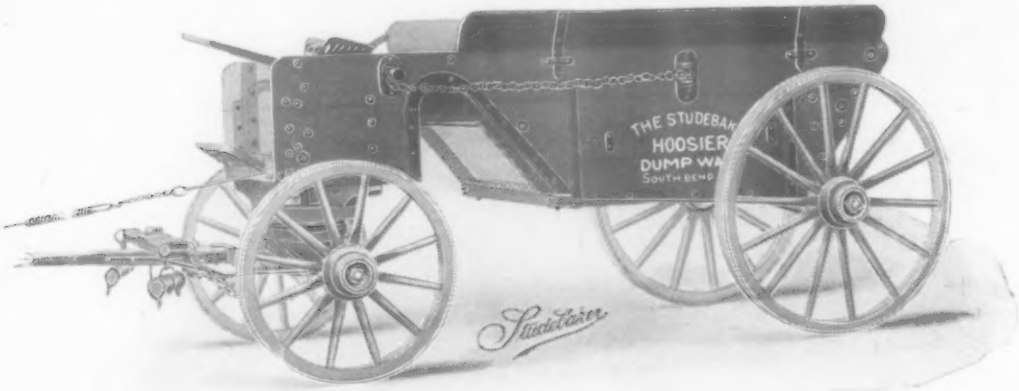

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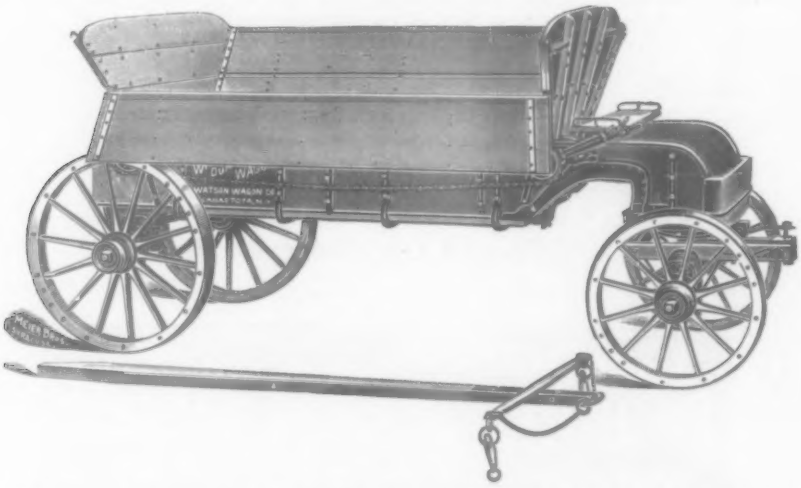

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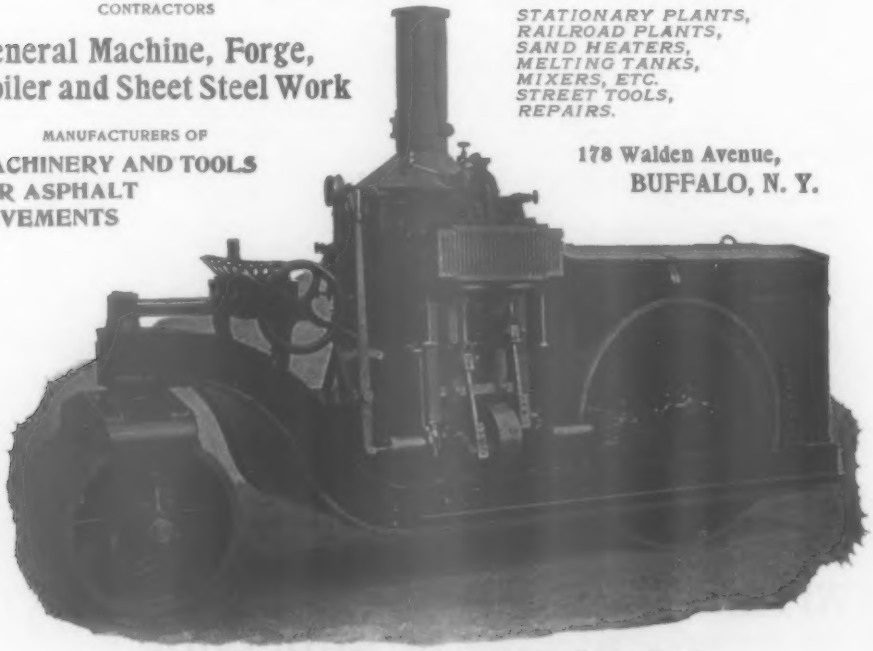

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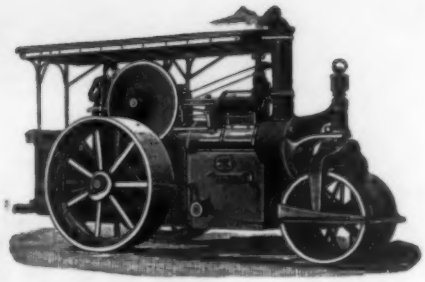

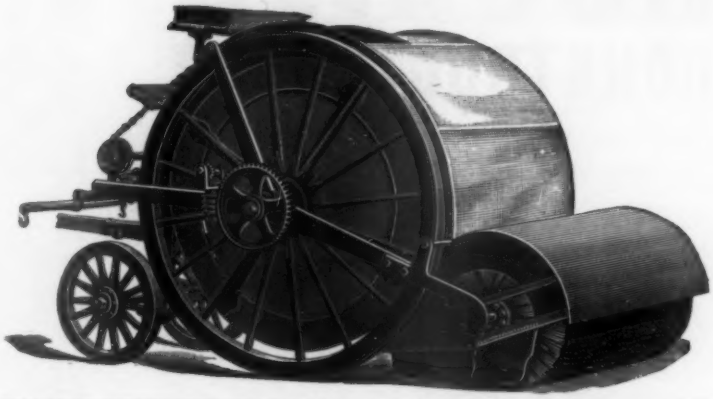

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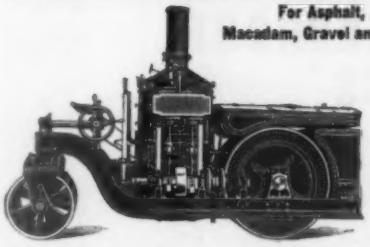

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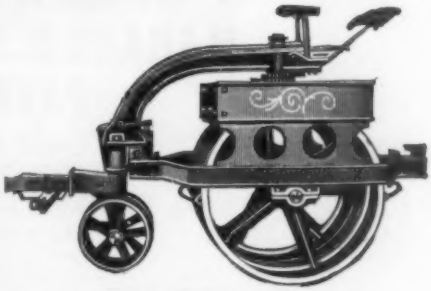

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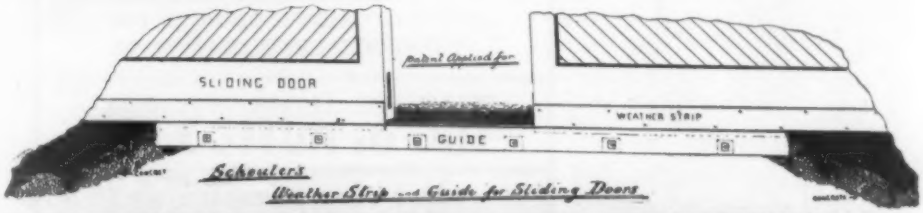

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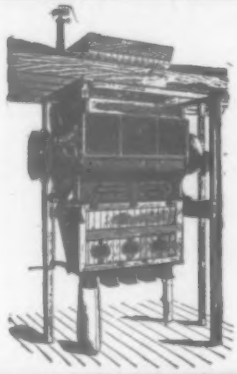

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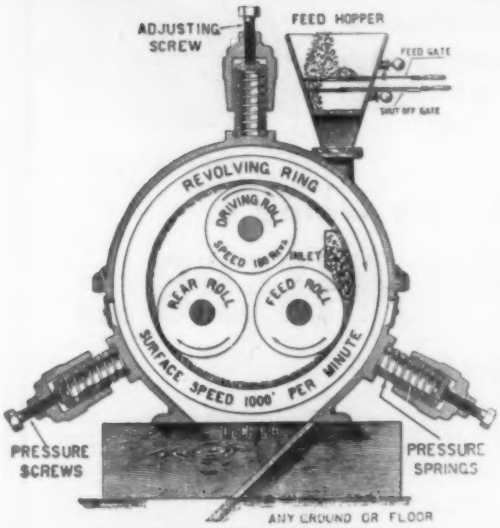

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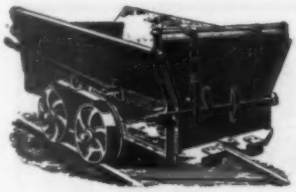

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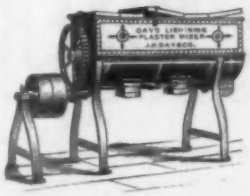

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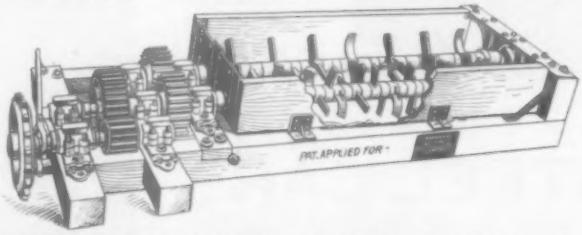

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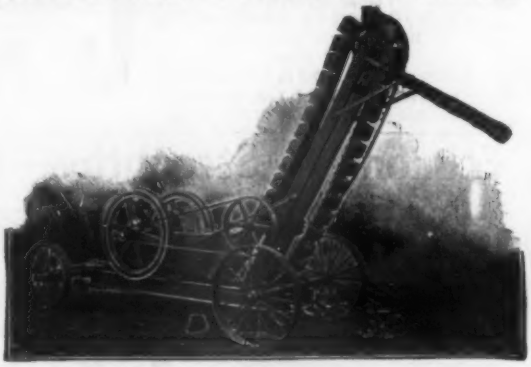

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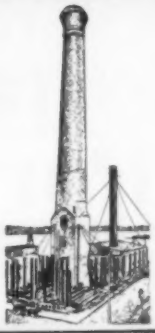

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MUNICIPAL ENGINEERING.

PUBLISHED BY
MUNICIPAL ENGINEERING CO.
INDIANAPOLIS.
NEW YORK OFFICE, 1 BROADWAY.
WILLIAM FORTUNE, *President.*
CHARLES CARROLL BROWN, M. AM. SOC. C. E., *Editor.*
M. F. TANSY, *News Editor.*
W. P. COSGROVE, *Advertising Manager.*
A. F. CRUSE, *Ass't Advertising Manager.*

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Entered at Post-Office, Indianapolis, Ind., as Second-Class Mail Matter.

Sale of Asphalt Mines and Plant

By order of the United States District Court, Chicago, Ill., dated July 1, 1902, the very valuable **ASPHALT MINES**, as described below, in Utah, owned by the Assyrian Asphalt Company, Chicago, for several years, will be sold in

Chicago, September 10, 1902, to the Highest Bidder, to-wit:

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WASATCH ASPHALTIC LIMESTONE MINE, at Assyria, County of Wasatch, Utah, U. S. Government Patent.

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Address all communications to

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JAMES BOYD, Attorney for Trustee.

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John A. Cole & Son, Chicago, Ill.
Downey & Wilcox, Anderson, Ind.
John B. Duncklee, New York, N. Y.
John P. Force, Columbus, O.
Howard Egleston, Havana, Cuba.
Gordon Engineering & Construction Co., Cincinnati, O.
C. G. H. Goss, Martinsville, Ind.
John J. Hainsworth, Indianapolis, Ind.
Hassan, Tagge & Dean, Detroit, Mich.
Hering & Fuller, New York, N. Y.
Ingram & Leftwich, Nashville, Tenn.
Iowa Engineering Co., Clinton, Iowa.
Jeup, Moore & Minor, Indianapolis, Ind.
John Lorentz, Hamilton, Ohio.
M. W. Kingsley, Cleveland, O.
Chester R. McFarland, Cleveland, O.
R. E. McMath Surveying Co., St. Louis, Mo.
Dabney H. Maury, Peoria, Ill.
The Municipal Engineering Co. (Inc.), New York City.
George S. Pierson, Kalamazoo, Mich.
Ohio Engineering Company, Elyria, O.
Clement L. Reamer, Newark, O.
Walter P. Rice Engineering Co., Cleveland, O.
S. Bent Russell, St. Louis, Mo.
Shedd & Sarle, Providence, R. I.
W. S. Shields, Chicago, Ill.
Snow & Barbour, Columbus, O.
J. B. Stuart, Pittsburg, Pa.
R. H. Tingley, Providence, R. I.
Walter R. Toy, Lima, O.
M. Tschirgi, Jr., Dubuque, Iowa.
Wardle & Yeager, Cedar Rapids, Iowa.
Waring, Chapman & Farquhar, New York, N. Y.
Wise & Watson, Passaic, N. J.
Frank W. Wood, Chicago, Ill.

Clay-Working Machinery.

The Bonnot Co., Canton, O.
Chambers Bros. Co., Philadelphia, Pa.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.

Clay Products.

American Clay Mfg. Co. of N. J., Pittsburg, Pa.
H. J. Conkling, Cincinnati, O.
Ferris Brick Co., Mechanicsville, N. Y.
Reese-Hammond Fire Brick Co., Bolivar, Pa.

Coal and Coke.

Schaeffer & Gengnagel, Dayton, O.

Coal Tar.

T. F. McClure & Sons Co., Cincinnati, O.
E. B. Warren & Co., Washington, D. C.
Warren Bros. Co., Boston, Mass.
Warren Bros. Co., Philadelphia, Pa.

Combined Curb and Gutter.

Acme Paving Co., Columbus, O.
D. C. Buntin, Indianapolis, Ind.
H. A. Lensing, Evansville, Ind.
Harry C. McKay, Cincinnati, O.
M. C. Russell Cement Paving Co., Springfield, O.
W. H. Settle & Co., Cincinnati, O.
Warren Bros. Co., Boston, Mass.

Concrete Mixers.

A. B. Black, Concord, N. H.
Chambers Bros Co., Philadelphia, Pa.
Contracters Plant Co., Boston, Mass.
J. H. Day & Co., Cincinnati, O.
Drake Standard Machine Works, Chicago, Ill.
W. D. Dunning, Syracuse, N. Y.
Fisher & Saxton Co., Washington, D. C.
Jeffrey Mfg. Co., Columbus, O.
Julian Scholl & Co., New York City.

Concrete Steel Arch Bridges.

Concrete Steel Engineering Co., New York City.

Concrete Work.

James W. Ball, Wyncote, Pa.
W. W. Benson, Terre Haute, Ind.
Beardstown Concrete Construction Co., Beardstown, Ill.
S. W. Coombs & Son, Cedar Falls, Ia.
Thos. L. Dooley, Chicago, Ill.
Erimus Construction Company, Indianapolis, Ind.
Thos. C. Farrell, Washington, N. J.
J. G. Hutchinson, Hamilton, O.
H. A. Lensing, Evansville, Ind.
John A. McGarry & Co., Chicago, Ills.
Stevens Cast Stone Co., Chicago, Ill.
Warren Bros. Co., Boston, Mass.

Contractors.

Acme Paving Co., Columbus, O.
American Art Tile Co., Columbus, Ohio.
James W. Ball, Wyncote, Pa.
Thos. Bridges' Sons, Wabash, Ind.
D. C. Buntin, Indianapolis, Ind.
The Central Bitulithic Paving Co., Zanesville, O.
City Wastes Disposal Co., New York City.
Cleveland Silex Stone Co., Detroit, Mich.
R. F. Conway Co., Chicago, Ill.
H. G. Coldwell, Indianapolis, Ind.
Thos. L. Dooley, Chicago, Ill.
Joseph J. Duffy & Co., Chicago, Ill.
Wm. Fife & Son, Indianapolis, Ind.
Fielding & Shepley, St. Paul, Minn.
Jas. P. Graham, Brooklyn, N. Y.
Otto E. C. Guelich, Detroit, Mich.
J. U. Fritchey, Lancaster, Pa.
Gilsonite Construction Co., St. Louis, Mo.
Gordon Engineering and Construction Co., Cincinnati, O.
J. H. Green & Son, Appleton, Wis.

Hoosier Construction Co., Indianapolis, Ind.
J. G. Hutchinson, Hamilton, O.
Ingram & Leftwich, Nashville, Tenn.
F. H. Kirchner & Co., Cincinnati, Ohio.
H A. Lensing, Evansville, Ind.
John Lipps, Cincinnati, O.
John A. McGarry & Co., Chicago, Ill.
Harry C. McKay, Cincinnati, O.
J. H. Marden Cement Paving Co., La Crosse, Wis.
Nashville Roofing & Paving Co., Nashville, Tenn.
Nelson Paving Co., Waco, Tex.
A. G. Pugh, Columbus, O.
Rogers & Dunlop, Indianapolis, Ind.
M. C. Russell Cement Paving Co., Springfield, O.
Schillinger Bros. Co., Toledo, O.
B. M. & J. F. Shanley, Philadelphia, Pa.
W. H. Settle & Co., Cincinnati, O.
Smith, Moss & Brown, Chicago, Ill.
Standard Paving Co., Newark, N. J.
Troy Public Works Co., Utica, N. Y.
Chas. H. Warford & Co , Dayton, O.
Wright & Childers, Grammer, Ind.

Contractors and Builders.

Erimus Construction Company, Indianapolis, Ind.
J. G. Hutchinson, Hamilton, O.

Contractors' Supplies.

H. J. Conkling, Cincinnati, O.
Ellis-Blum Co., Meadville, Pa.
Queen City Supply Co., Cincinnati, O.
Schaeffer & Gengnagel, Dayton, O.
Chas. H. Warford & Co., Dayton, O.
E. B. Warren & Co., Washington, D. C.

Contractors' Wagons.

Studebaker Bros. Mfg. Co., South Bend, Ind.
D. S. Watson, Canastota, N. Y.

Contractors' Tools and Machinery.

Acme Road Machinery Co., Frankfort, N. Y.
W. H. Anderson & Sons, Detroit, Mich.
Austin & Western Co., Ltd., Chicago, Ill.
Contractors' Plant Co., Boston, Mass.
F. H. Crafts, Rochester, N. Y.
Queen City Supply Co., Cincinnati, O.
A. B. Black, Concord, N. H.
Contractors' Tool Company, Philadelphia, Pa.
Orr & Lockett Hardware Co., Chicago, Ill.
Julian Scholl & Co., New York City.
Syracuse Chilled Plow Co., Syracuse, N. Y.
Wiard Plow Co., Batavia, N. Y.

Conveyors.

C. O. Bartlett & Co., Cleveland, O.
Carson Trench Machine Co., Boston, Mass.
Dodge Manufacturing Company, Mishawaka, Ind.
The Jeffrey Mfg. Co., Columbus, O.
Niles Mine and Mill Supply Co., Niles, O.
Syracuse Chilled Plow Company, Syracuse, N. Y.

Corrugated Iron and Steel.

Niles Mine & Mill Supply Co., Cleveland, O.
W. B. Scaife & Sons Co., Pittsburg, Pa.

Creosoted Wood Block.

Hoosier Construction Co., Indianapolis, Ind.
Republic Chemical and Creosoting Co., Indianapolis, Ind.
Terre Haute Creosoting Co., Terre Haute, Ind.

Crushers, Rock and Ore.

Austin & Western Co., Ltd., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
Julian Scholl & Co., New York City.
Kent Mill Co., New York.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.

Crushed Stone.

Thos. Bridges' Sons, Wabash, Ind.
Cleveland Stone Co., Chicago, Ill.

Culvert Pipe, Vitrified.

American Clay Mfg. Co. of N. J., Pittsburg, Pa.
Buckeye Fire Clay Co., Uhrichsville, O.
H. J. Conkling, Cincinnati, O.
Evens & Howard, St. Louis, Mo.
Mecca Clay Works, Mecca, Parke Co., Ind.
Michigan Sewer Pipe Co., Jackson, Mich.
Monmouth Mining and Mfg. Co., Monmouth, Ill.
Royal Sewer Pipe & Fire Brick Co., Akron, O.
H. Stevens' Sons Co., Macon, Ga.
U. S. Clay Mfg. Co., Griffin, Ill.
Thos. L. Dooley, Chicago, Ill.

Curbing.

James W. Ball, Wyncote, Pa.
D. C. Buntin, Indianapolis, Ind.
Cleveland Stone Company, Cleveland, O.
Jas. P. Graham, Brooklyn, N. Y.
Hollensbe Stone Co., Westport, Ind.
H. A. Lensing, Evansville, Ind.
Harry C. McKay, Cincinnati, O.
Ohio Stone and Paving Co., Youngstown, O.
Rogers & Dunlop, Indianapolis, Ind.
W. H. Settle & Co., Cincinnati, O.
Warren Bros. Co., Boston, Mass.

Derricks.

Queen City Supply Co., Cincinnati, O.

Drain Tile.

H. J. Conkling, Cincinnati, O.
D. J. Kennedy, Pittsburg, Pa.
Michigan Sewer Pipe Co., Jackson, Mich.
Royal Sewer Pipe & Fire Brick Co., Akron, O.

Drawing Papers.

Pittsburg Blue Print Co., Pittsburg, Pa.

Dryers.

Cleveland Car Co., Cleveland, O.
J. H. Day & Co., Cincinnati, O.
Iroquois Iron Works, Buffalo, N. Y.

Dump Cars.

Niles Mine & Mill Supply Co., Cleveland, O.

Dumps.

Cleveland Car Co., Cleveland, O.

Dump Wagons.

Studebaker Bros. Mfg. Co., South Bend, Ind.
United States Sanitary Co., Washington, D. C.
Watson Wagon Co., Canastota, N. Y.

Electrical Supplies.

W. Grant Thorpe, Newburgh, N. Y.

Electrolytic Investigations.

Dabney H. Maury, Peoria, Ill.

Engines, Portable and Stationary.

Marinette Iron Works, Marinette, Wis.
Queen City Supply Co., Cincinnati, O.

Filtration Plant.

Wm. B. Scaife & Sons Co., Pittsburg, Pa.

Feed Water Plants.

Wm. B. Scaife & Sons Co., Pittsburg, Pa.

Fire Alarms.

Gamewell Fire Alarm Telegraph Co., New York City.

Fire Brick.

American Clay Mfg. Co. of N. J., Pittsburg, Pa.
Clearfield Clay Working Co., Clearfield, Pa.
H. J. Conkling, Cincinnati, O.
Evens & Howard, St. Louis, Mo.
Kentucky Fire Brick Co., Portsmouth, O.
Michigan Sewer Pipe Co., Jackson, Mich.
Reese-Hammond Fire Brick Co., Bolivar, Pa.
Royal Sewer Pipe & Fire Brick Co., Akron, O.
H. Stevens' Sons Co., Macon, Ga.

Fire Clay Products.

American Clay Mfg. Co. of N. J., Pittsburg, Pa.
Buckeye Fire Clay Co., Uhrichsville, O.
Clearfield Clay Working Co., Clearfield, Pa.
H. J. Conkling, Cincinnati, O.
Evens & Howard, St. Louis, Mo.
Ferris Brick Co., Mechanicsville, N. Y.
Kentucky Fire Brick Co., Portsmouth, O.
Mecca Clay Works, Mecca, Parke Co., Ind.
Michigan Sewer Pipe Co., Jackson, Mich.
Monmouth Mining and Mfg. Co., Monmouth, Ill.
Reese-Hammond Fire Brick Co., Bolivar, Pa.
The Royal Sewer Pipe & Fire Brick Co., Akron, O.
H. Stevens' Sons Co., Macon, Ga.
J. L. Van Natta & Co., Lafayette, Ind.

Fire Wagons.

Robert Hooke, Chattanooga, Tenn.

Flagging.

Cleveland Stone Co., Cleveland, O.
Hollensbe Stone Co., Westport, Ind.

BUSINESS DIRECTORY—CONTINUED.

Flint Pebbles.

John D. McGlincey, New York, N. Y.

Flue Liners.

American Clay Mfg. Co. of N. J., Pittsburg, Pa.
H. J. Conkling, Cincinnati, O.
Royal Sewer Pipe & Fire Brick Co., Akron, O.

Flush Tanks.

Pacific Flush Tank Co., Chicago, Ill.

Garbage Carts.

United States Sanitary Co., Washington, D. C.

Garbage Disposal Plants.

City Wastes Disposal Co., New York City.
The Municipal Engineering Co. (Inc.), New York City.

Gas Engines.

August Mietz, New York City.
Marinette Iron Works Mfg. Co., Marinette, Wis.

Granite.

T. F. McClure & Sons Co., Cincinnati, O.

Hoisters.

W. H. Anderson & Sons, Detroit, Mich.
C. O. Bartlett & Co., Cleveland, O.
Carson Trench Machine Co., Boston, Mass.
Potter Mfg. Co., Indianapolis, Ind.

Hollow Block Machinery.

Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.

Hose Coupling.

The W. J. Clark Co., Salem, O.

Hydraulic Cement.

H. J. Conkling, Cincinnati, O.
Meacham & Wright, Chicago, Ill.
Milwaukee Cement Co., Milwaukee, Wis.

Hydraulic Rams.

Power Specialty Co., New York.

Incandescent Lamps.

General Incandescent Lamp Co., Cleveland, O.
W. Grant Thorpe, Newburgh, N. Y.

Iron Paving Block.

American Street Railway Paving & Improvement Co., Springfield, Mass.

Kerosene Engines.

August Mietz, New York City.

Lamps, Electric.

General Incandescent Lamp Co., Cleveland, O.

Lamps, Gas and Gasoline.

Brilliant Gas Lamp Co., Chicago, Ill.
Cleveland Vapor Light Co., Cleveland, O.
Reserve Foundry & Mfg. Co., Cleveland, O.

Landscape Engineers.

Mason L. Brown, Detroit, Mich.

Lawn Mowers.

Clipper Lawn Mower Co., Norristown, Pa.

Lime.

H. J. Conkling, Cincinnati, O.
A. H. Lauman, Pittsburg, Pa.

Locomotives.

H. K. Porter Co., Pittsburg, Pa.

Macadam and Concrete Stone.

B. M. & J. F. Shanley, Philadelphia, Pa.

Macadamizing.

James W. Ball, Wyncote, Pa.
James P. Graham Brooklyn, N. Y.
Troy Public Works Co., Utica, N. Y.
Warren Bros. Co., Boston, Mass.
Wright & Childers, Grammer, Ind.

Marbleithic Flooring.

The Marbleithic Co., Dayton, O.

Mechanical Engineers.

W. H. Bryan, St. Louis, Mo.
Dabney H. Maury, Peoria, Ill.

Municipal Fire Alarms.

Gamewell Fire Alarm Telegraph Co., New York City.

Municipal Lighting.

Abner Acetylene Gas Co., Chicago, Ill.
Brilliant Gas Lamp Co., Chicago, Ill.
Cleveland Vapor Light Co., Cleveland, O.
John Lorenz, Hamilton, Ohio.
Reserve Foundry & Mfg. Co., Cleveland, O.

Paving Blocks.

Clinton Paving and Building Brick Company, Clinton, Ind.
Kentucky Fire Brick Co., Portsmouth, O.
Metropolitan Paving Brick Co., Canton, O.
Purington Paving Brick Co., Galesburg, Ill.
Roseville Brick and Terra Cotta Co., Roseville, O.
Saginaw Clay Mfg. Co., Saginaw, E. S., Mich.
Springfield Paving Brick Co., Springfield, Ill.

Paving Brick.

American Clay Mfg. Co. of N. J., Pittsburg, Pa.
Clearfield Clay Working Co., Clearfield, Pa.
Clinton Paving and Building Brick Co., Clinton, Ind.
W. S. Dickey Clay Mfg. Co., Kansas City, Mo.
Ferris Brick Co., Mechanicsville, N. Y.
Galesburg Paving Brick Company, Galesburg, Ill.
Kentucky Fire Brick Co., Portsmouth, O.
T. F. McClure & Sons Co., Cincinnati, O.
Metropolitan Paving Brick Co., Canton, O.
Moore, E. H., Chicago, Ill.
Purington Paving Brick Co., Galesburg, Ill.
Reese-Hammond Fire Brick Co., Bolivar, Pa.
Roseville Brick and Terra Cotta Co., Roseville, O.
Saginaw Clay Mfg. Co., Saginaw, E. S., Mich.
Sangamo Brick Company, Springfield, Ill.
Scranton Vitrified Brick and Tile Company, Scranton, Pa.
Springfield Paving Brick Co., Springfield, Ill.
Wabash Clay Mfg. Co., Veedersburg, Ind.

Paving Brick Machinery.

Chambers Bros. Co., Philadelphia, Pa.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.

Paving, Cement Sidewalk.

H. G. Coldwell, Indianapolis, Ind.
S. W. Coombs & Son, Cedar Falls, Ia.
Thos. L. Dooley, Chicago, Ill.
Ohio Stone & Paving Co., Youngstown, O.
Rogers & Dunlop, Indianapolis, Ind.

Paving Contractors.

James W. Ball, Wyncote, Pa.
The Central Bitulithic Paving Co., Zanesville, O.
Cleveland Silex Stone Co., Detroit, Mich.
H. G. Coldwell, Indianapolis, Ind.
R. F. Conway Co., Chicago, Ill.
Thos. L. Dooley, Chicago, Ill.
Joseph J. Duffy & Co., Chicago, Ill.
Jas. P. Graham, Brooklyn, N. Y.
Fielding & Shepley, St. Paul, Minn.
J. U. Fritchey, Lancaster, Pa.
Gilsonite Construction Co., St. Louis, Mo.
J. H. Green & Son, Appleton, Wis.
Hoosier Construction Co., Indianapolis, Ind.
Ingram & Leftwich, Nashville, Tenn.
F. H. Kirchner & Co., Cincinnati, O.
Lake Erie Asphalt Block Co., Toledo, O.
J. H. Marden Cement Paving Co., La Crosse, Wis.
John A. McGarry & Co., Chicago, Ill.
Nashville Roofing & Paving Co., Nashville, Tenn.
Nelson Paving Co., Waco, Tex.
A. G. Pugh, Columbus, O.
Republic Chemical & Creosoting Co., Indianapolis, Ind.
M. C. Russell Cement Paving Co., Springfield, O.
Schillinger Bros. Co., Toledo, O.
W. H. Settle & Co., Cincinnati, O.
Smith, Moss & Brown, Chicago, Ill.
Standard Paving Co., Newark, N. J.
Troy Public Works Co., Utica, N. Y.
Western Construction Co., Lafayette, Ind.
Western Paving & Supply Co., Indianapolis, Ind.
Warren Asphalt Paving Co., Utica, N. Y.
Warren Bros. Co., Boston, Mass.

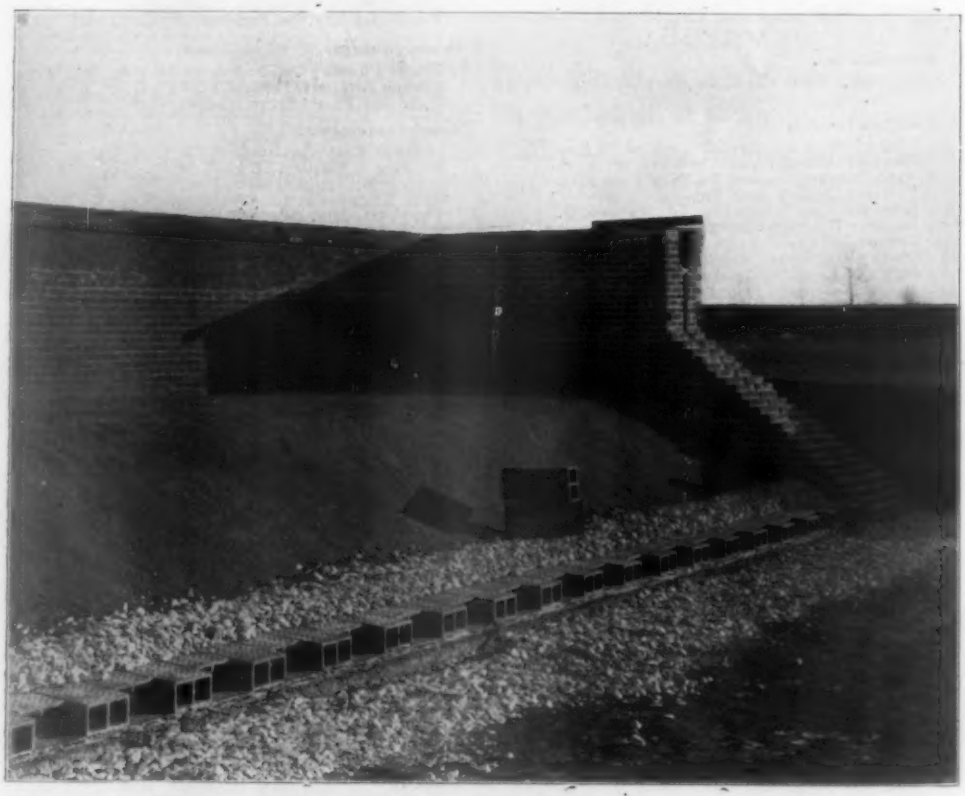
Paving Pitch.

Ellis-Blum Co., Meadville, Pa.
E. B. Warren & Co., Washington, D. C.

THE UNITED STATES SAND FILTRATION COMPANY

CONSTRUCTORS OF

SLOW SAND FILTRATION SYSTEMS



PATENTED

METHOD OF CONSTRUCTION

Our method of construction reduces the first cost to that of mechanical filtration, and all parts are prominent. No coagulant is used and cost of cleaning is reduced to a minimum as manual labor is dispensed with.

INDIANAPOLIS AND NEW YORK

BUSINESS DIRECTORY—CONTINUED.

Paving Tools.
W. H. Anderson & Sons, Detroit, Mich.
Contractors' Tool Company, Philadelphia, Pa.
F. H. Crafts, Rochester, N. Y.
Iroquois Iron Works, Buffalo, N. Y.
Orr & Lockett Hardware Co., Chicago, Ill.
Julian Scholl & Co., New York City.

Pipe Couplings.
Dayton Pipe & Cable Coupling Co., Dayton, O.

Pipe, Riveted Steel.
W. B. Scaife & Sons, Pittsburg, Pa.

Pipe and Fittings.
Queen City Supply Co., Cincinnati, O.

Plasticon.
Michigan Gypsum Co., Grand Rapids, Mich.

Plaster Mixer.
J. H. Day & Co., Cincinnati, O.

Police Alarms.
Gamewell Fire Alarm Telegraph Co., New York City.

Portland Cement.
Alpha Portland Cement Co., Alpha, N. J.
Alsen's Portland Cement Works, New York.
Atlas Portland Cement Co., New York City.
F. Behrend, New York City.
Brier Hill Coal & Iron Co., Youngstown, O.
Buckeye Portland Cement Co., Bellefontaine, O.
Cayuga Lake Cement Co., Ithaca, N. Y.
Commercial Wood and Cement Co., Philadelphia.
H. J. Conkling, Cincinnati, O.
Detroit Portland Cement Co., Detroit, Mich.
Empire Portland Cement Co., Warner, N. Y.
Gabriel & Schall, New York City.
Glens Falls Portland Cement Co., Glens Falls, N. Y.
W. G. Hartranft Cement Company, Philadelphia, Pa.
Illinois Steel Co., Chicago, Ill.
Kelley Island Lime and Transport Co., Cleveland.
Lawrence Cement Co., New York City.
Lesley & Trinkle, Philadelphia, Pa.
Lehigh Portland Cement Co., Allentown, Pa.
Meacham & Wright, Chicago, Ill.
Michigan Alkali Company, Wyandotte, Mich.
New Jersey Portland Cement Co., Perth Amboy, N. J.
Omega Portland Cement Co., Jonesville, Mich.
Peninsular Portland Cement Co., Jackson, Mich.
Vulcanite Portland Cement Company, Philadelphia, Pa.
Wabash Portland Cement Co., Detroit, Mich.
Charles Warner & Co., New York.

Power Transmission.
Dodge Manufacturing Company, Mishawaka, Ind.
Jeffrey Mfg. Co., Columbus, O.
Power Specialty Co., New York, N. Y.

Pumping Engines, Steam.
Pulsometer Steam Pump Co., New York City.
Irvin Van Wie, Syracuse, N. Y.

Pump Valves.
Power Specialty Co., New York, N. Y.

Push Brooms.
Joseph Lay Co., Ridgeville, Ind.

Railroad Grading.
J. U. Fritchey, Lancaster, Pa.
Hoosier Construction Company, Indianapolis, Ind.

Rails.
Niles Mine & Mill Supply Co., Cleveland, O.

Road Machinery.
Acme Road Machinery Co., Frankfort, N. Y.
Austin & Western Co., Ltd., Chicago, Ill.
A. B. Black, Concord, N. H.
Julian Scholl Co., New York City.
Syracuse Chilled Plow Co., Syracuse, N. Y.

Road Rollers.
Enterprise Mfg. Co., Columbiana, O.
Erie Machine Shop, Erie, Pa.
Iroquois Iron Works, Buffalo, N. Y.
O. S. Kelly Co., Springfield, O.
Julian Scholl & Co., New York City.

Rope, Wire and Manila.
Queen City Supply Co., Cincinnati, O.

Screening Machinery.
Jeffrey Mfg. Co., Columbus, O.

Sewage Disposal.
Cameron Septic Tank Company, Chicago, Ill.
City Wastes Disposal Co., New York City.
The Municipal Engineering Co. (Inc.), New York City.
Snow & Barbour, Columbus, O.

Sewer Braces.
Dunn Manufacturing Co., Pittsburg.
The Potter Mfg. Co., Indianapolis, Ind.

Sewer Castings.
Byram Foundry Co., Indianapolis, Ind.
Kramer Brothers, Dayton, O.
H. W. McDonald & Son, Galion, O.

Sewer Contractors.
James P. Graham, Brooklyn, N. Y.
Fielding & Shepley, St. Paul, Minn.
J. U. Fritchey, Lancaster, Pa.
F. H. Kirchner & Co., Cincinnati, O.
The Potter Mfg. Co., Indianapolis, Ind.
W. H. Settle & Co., Cincinnati, O.
Troy Public Works Co., Utica, N. Y.

Sewer Machines.
Carson Trench Machine Co., Boston.
Potter Mfg. Co., Indianapolis, Ind.

Sewer Pipe.
American Clay Mfg. Co. of N. J., Pittsburg, Pa.
Buckeye Fire Clay Co., Uhrichsville, O.
H. J. Conkling, Cincinnati, O.
W. S. Dickey Clay Mfg. Co., Kansas City, Mo.
Evens & Howard, St. Louis, Mo.
D. J. Kennedy, Pittsburg, Pa.
Mecca Clay Works, Mecca, Parke Co., Ind.
Michigan Sewer Pipe Co., Jackson, Mich.
Monmouth Mining and Mfg. Co., Monmouth, Ill.
Red Wing Sewer Pipe Co., Red Wing, Minn.
The Royal Sewer Pipe & Fire Brick Co., Akron, O.
Schaeffer & Gengnagel, Dayton, Ohio.
T. W. Spinks, Covington, Ky.
H. Stevens' Sons Co., Macon, Ga.
U. S. Clay Mfg. Co., Griffin, Ill.

Shafting.
Dodge Mfg. Co., Mishawaka, Ind.

Sheet Iron Works.
W. B. Scaife & Sons Co., Pittsburg, Pa.

Sprinkling Wagons.
Studebaker Bros. Mfg. Co., South Bend, Ind.
Austin & Western Co., Ltd., Chicago, Ill.

Stacks.
W. B. Scaife & Sons Co., Pittsburg, Pa.

Stall Floors.
Standard Paving Co., Newark N. J.

Steam Pumps.
Pulsometer Steam Pump Co., New York City.

Steam Superheaters.
Power Specialty Co., New York.

Steel Frame Construction.
W. B. Scaife & Sons Co., Pittsburg, Pa.

Stone, Broken.
Thos. Bridges' Sons, Wabash, Ind.
B. M. & J. F. Shanley, Jersey City, N. J.

Stone Pavements.
Cleveland Stone Co., Cleveland Co.
Hollensbe Stone Co., Westport, Ind.

More Evidence

Of the value of Municipal Engineering Magazine as an Advertising Medium

* * * We are having quite a few inquiries from the advertisement, and so far are perfectly satisfied.

CONTRACTORS' PLANT CO.

* * *

* * * Your paper is read by parties that are interested in my class of work, as I have already had many inquiries through your magazine.

C. W. STEVENS,
Stevens Cast Stone Co.

* * *

We appreciate very much the several instances in which you have referred special matters to us, and value highly the advertisement which is running in your paper.

RESERVE FOUNDRY & MFG. CO.

* * *

* * * The advantages I have received from my advertisement in MUNICIPAL ENGINEERING have been very satisfactory in every respect—in fact I have been kept busy the entire season by the business which I have received from this advertisement alone, as I am using no other publication at the present time.

W. W. BENSON.

If you want good advertising, the kind that PAYS, you should use Municipal Engineering. It is increasing in circulation and advertising patronage every issue

Municipal Engineering Company

Indianapolis, Indiana

Street Contractors' Supplies.

W. H. Anderson & Sons, Detroit, Mich.
Austin & Western Co., Ltd., Chicago, Ill.
A. B. Black, Concord, N. H.
H. J. Conkling, Cincinnati, O.
Iroquois Iron Works, Buffalo, N. Y.
The O. S. Kelly Co., Springfield, O
T. F. McClure & Sons Co., Cincinnati, O.
Julian Scholl & Co., New York City.
Syracuse Chilled Plow Co., Syracuse, N. Y.
Wiard Plow Co., Batavia, N. Y.

Street Crossings.

Cleveland Stone Co., Chicago, Ill.
Hollensbe Stone Co., Westport, Ind.

Street Lighting.

Barron-Collier Co., Memphis, Tenn.
Brilliant Gas Lamp Co., Chicago, Ill.
Cleveland Vapor Light Co., Cleveland, O.
Reserve Foundry & Mfg. Co., Cleveland, O.

Street Plows.

Queen City Supply Co., Cincinnati, O.
Syracuse Chilled Plow Company, Syracuse, N. Y.
Wiard Plow Co., Batavia, N. Y.

Street Scrapers.

Austin & Western Co., Ltd., Chicago, Ill.
A. B. Black, Concord, N. H.
Joseph Lay Co., Ridgeville, Ind.

Street Signs.

National Enameling Co., Cincinnati, O.
S. E. Norton, Evanston, Ill.

Street Sweeper Rolls.

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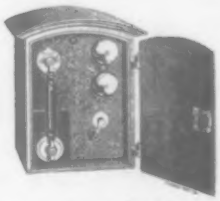

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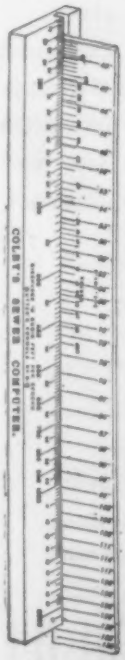

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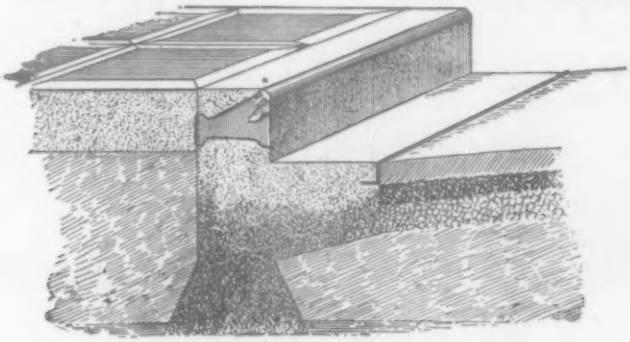

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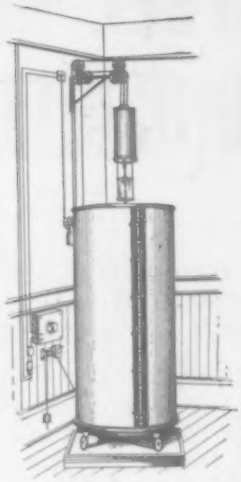

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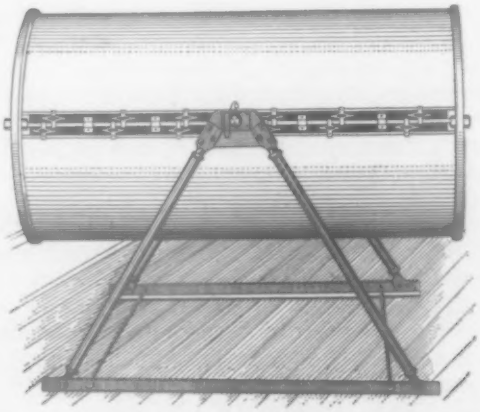

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Annual Capacity, 60,000,000
Celebrated Galesburg Brick
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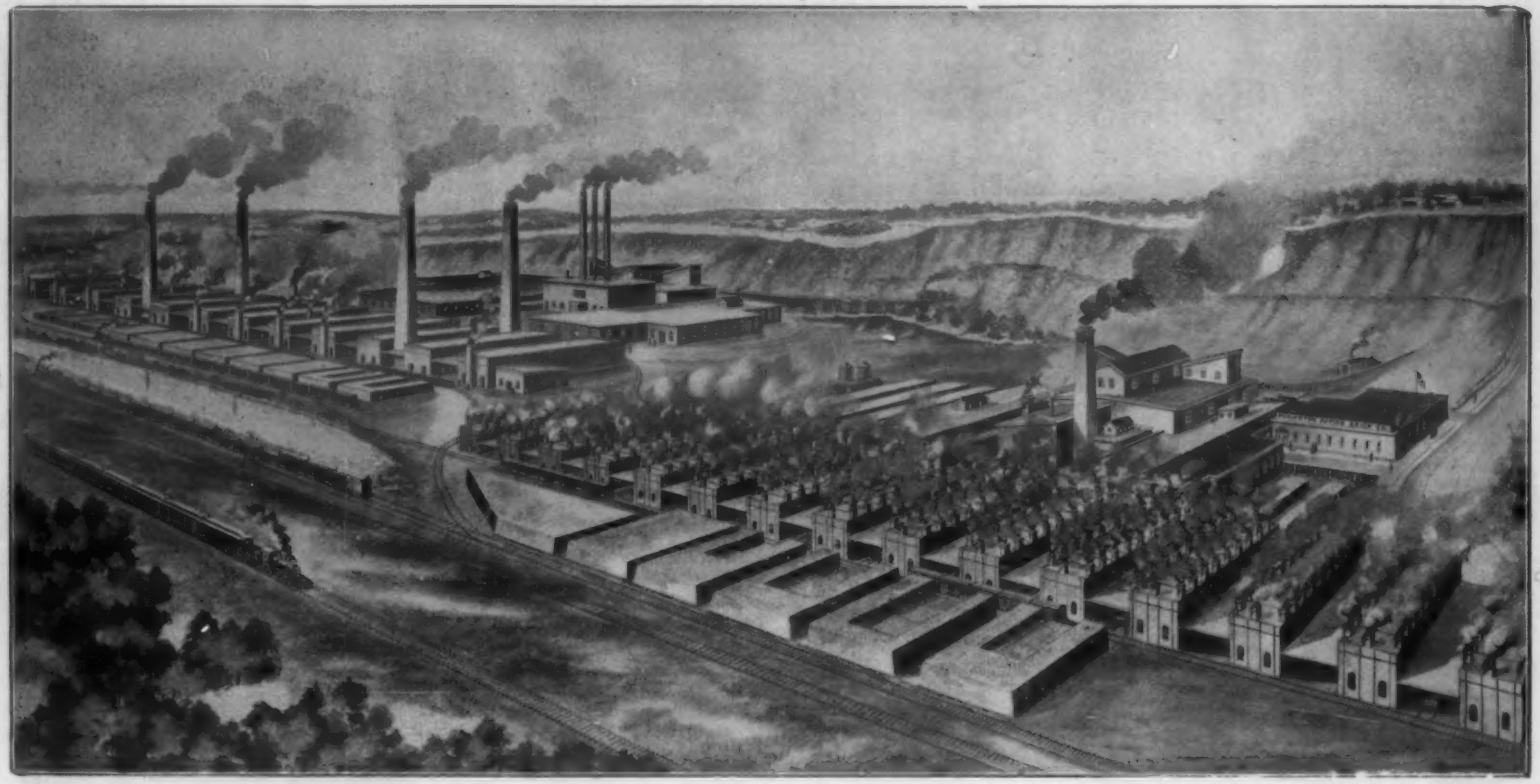

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CLINTON, INDIANA.

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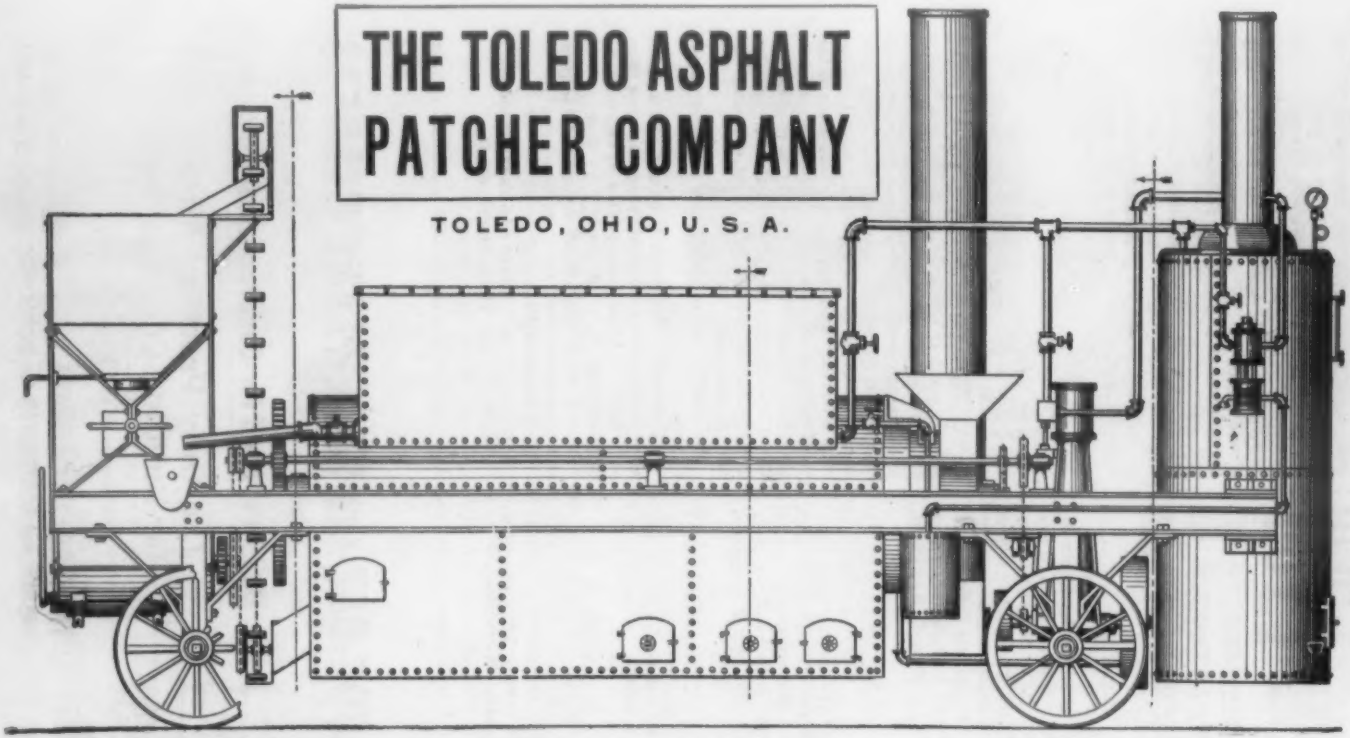

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Asphalt and Bituminous Macadam Paving Companies owning one of these machines will find the maintenance of pavements reduced to a minimum. The Toledo Asphalt Patcher Co. is an organization of Asphalt Experts, and in designing this machine, special attention has been given to the parts which years of experience have taught as most important. Never has there been an asphalt plant on four wheels equal to the capacity of **The Patcher.** So extremely portable, that it can be drawn by one team of horses through streets and alleys and turn corners with as much ease as with an ordinary dray.

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Do not think because we call this great machine **The Patcher**, that it is only intended for repair work. For Parks, Sidewalks and Cellars it stands alone. Why pay an enormous price for a plant, trackage, cartage, watchmen, etc., when two of these machines are equal to the same, and cost less, to say nothing of labor saved.

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CITY CIVIL ENGINEER.—Experienced. Owns transit, etc. Open for proposition. Address S. H. J., MUNICIPAL ENGINEERING.

FOR SALE.—Mr John A. McDowell, of Columbus, Ohio, has a Cement Testing Machine and a fine Chemical Balance for sale. Write him.

NOTICE TO CONTRACTORS.

Sealed proposals will be received by the board of public works at Indianapolis, Ind., until August 8, 1902, for paving the sidewalks of Vermont street from State avenue to Randolph street with cement; also, for constructing a local sewer and paving the roadway of Laura street from Washington to Jackson street, with flint rock macadam, with cement walks and brick gutters. Sealed proposals will be received until August 13 for the construction of a main sewer in Northwestern avenue and Twenty-fourth street.

The board of public works reserves the right to reject any or all bids.

HAROLD C. MEGREW,
EDWIN D. LOGSDON,
CHARLES MAGUIRE,
Board of Public Works.

SEALED PROPOSALS

Will be received at the office of the Board of Public Service until 12 o'clock noon of Tuesday, August 12, A. D. 1902, for the improvement of Jones street, from Stanton avenue to May street, by grading, setting curbs, paving the roadway with brick, and constructing the necessary drains, in accordance with plans and profiles on file in the office of the chief engineer of the Board of Public Service, and according to specifications on file in the office of Board of Public Service. The same to be paid for as provided in the resolution and ordinance for said improvement.

The board reserves the right of rejecting any or all bids.

Bidders must indorse their names and address upon the outside of the envelopes containing their bid. Each bid to be accompanied by two disinterested sureties.

Bidders to use the printed forms, as none other will be received.

By direction of the board.

ROBERT ALLISON, President.
GEO. F. HOLMES, Clerk, Cincinnati, O.

COMBINED BOX-CAP AND SHOE-PLANK HOLDERS

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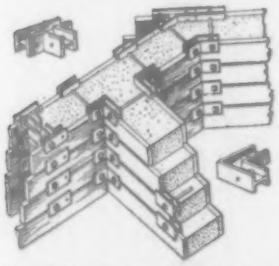

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NOTICE TO CONTRACTORS.

Bids will be received by the city of Chanute, Kansas, until 6 o'clock P. M., of August 5th, 1902, for paving with vitrified brick, crushed rock, or gravel foundations, Main (formerly Fourth) street, between Forest and Central avenues, in said city of Chanute, in accordance with the official plans and specifications of said city.

Bids must be sealed and addressed to the City Clerk, Chanute, Kansas.

A certified check for five (5) per cent. of the amount must accompany each bid.

Plans and specifications are on file and may be seen at the office of the city clerk, in Chanute, Kansas, and at the office of E. H. Ricksecker, city engineer, Coffeyville, Kansas, or may be had on application.

The right to reject any or all bids is reserved.

JOHN F. ROE, Mayor.

Attest: JOHN C. PENNY, City Clerk.

SEALED PROPOSALS.

OFFICE WASHINGTON AQUEDUCT,
2728 Pa. Ave., Washington, D. C., July 12, 1902.

Sealed proposals for 1,168,000 cu. yds. excavation, 122,300 cu. yds. concrete masonry, 2,200 tons cast iron pipe and specials, 120 sluice gates, 31 water valves, 27 Venturi meters, 141,000 cu. yds. filter sand, 47,600 cu. yds. gravel, 165,000 bbls. American Portland cement, 6 pressure controller valves, 150,000 feet glazed vitrified pipe (all more or less), and 120-million-gallon centrifugal pumping plant will be received here until 12 M. August 12, 1902, and then publicly opened. Information on application.

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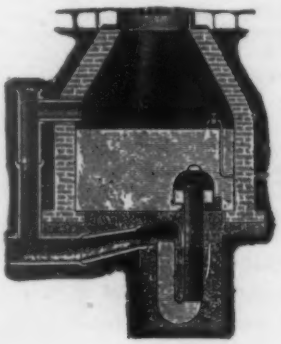

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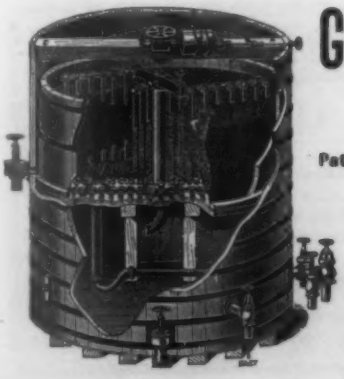

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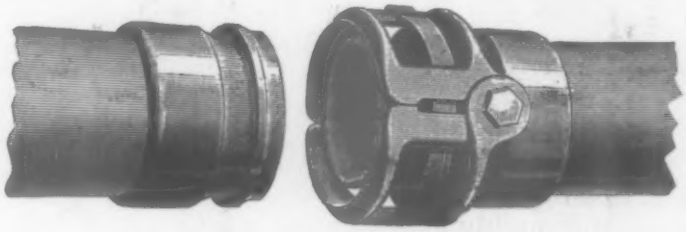

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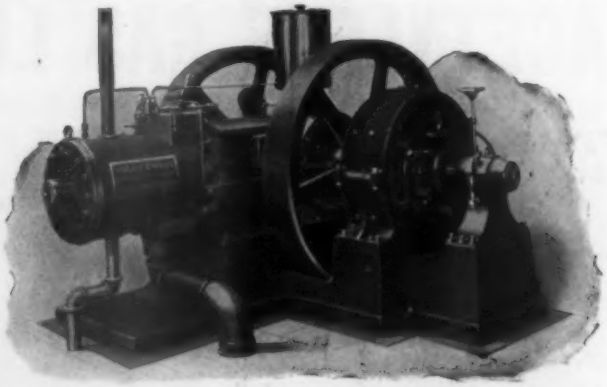

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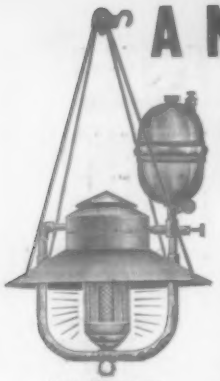

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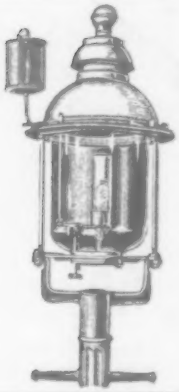

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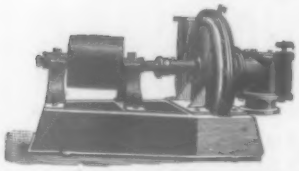

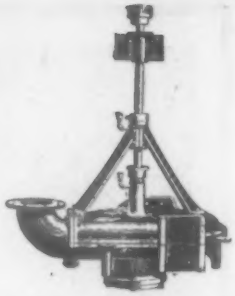

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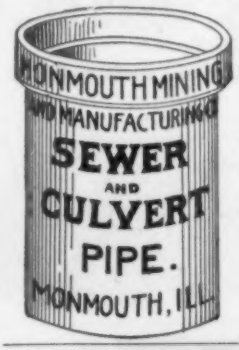

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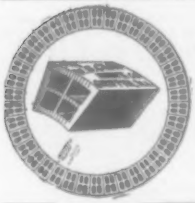

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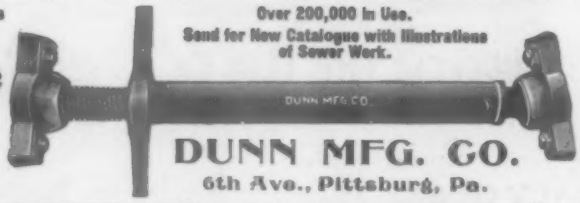

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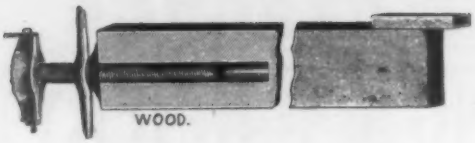

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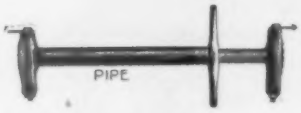

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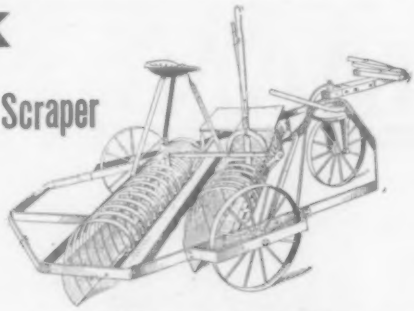

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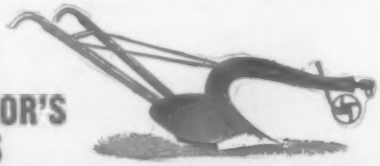

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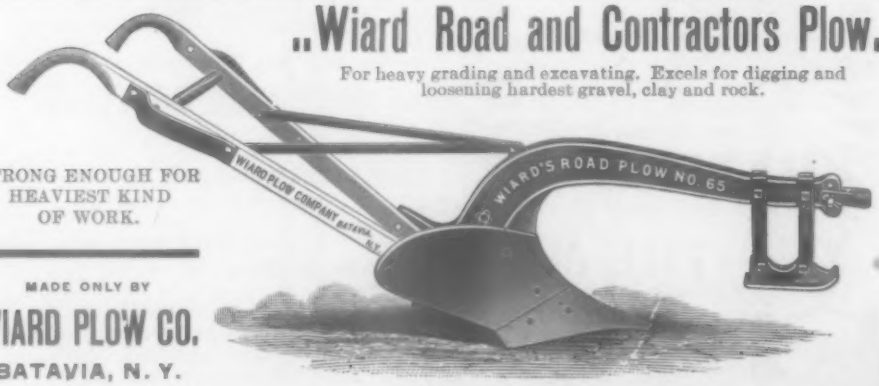

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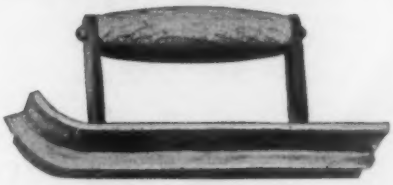

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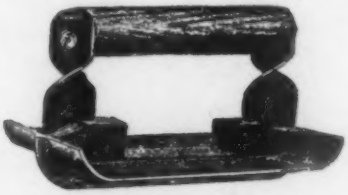

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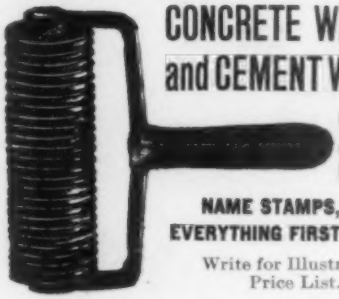

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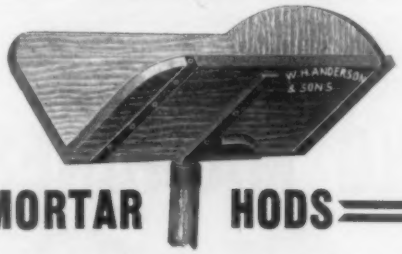

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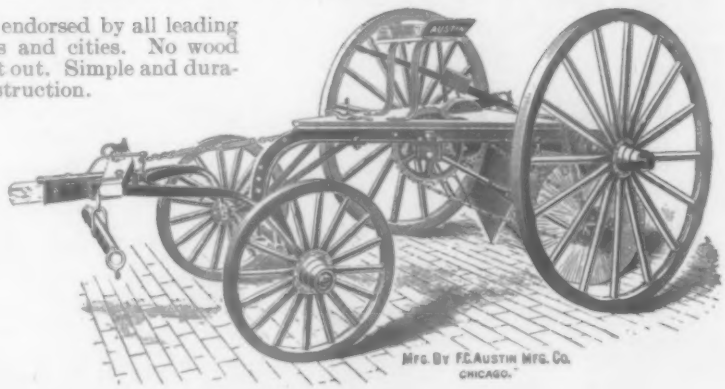

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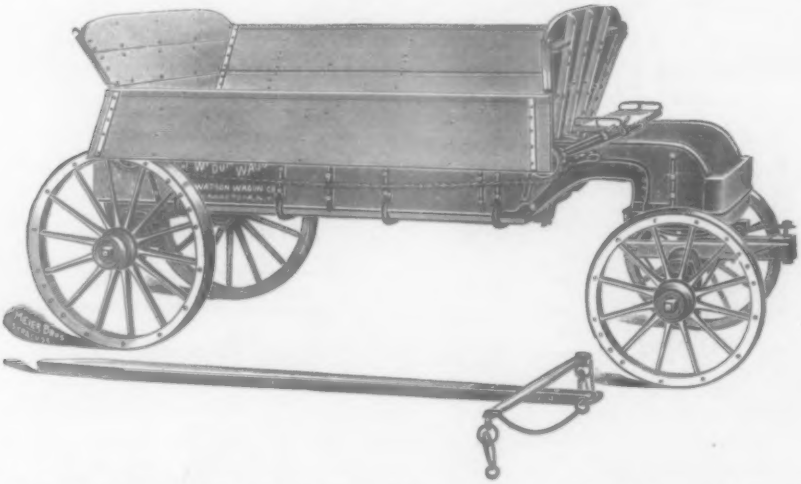

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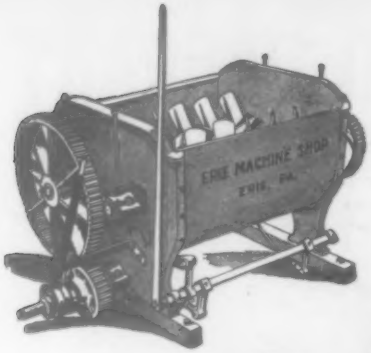

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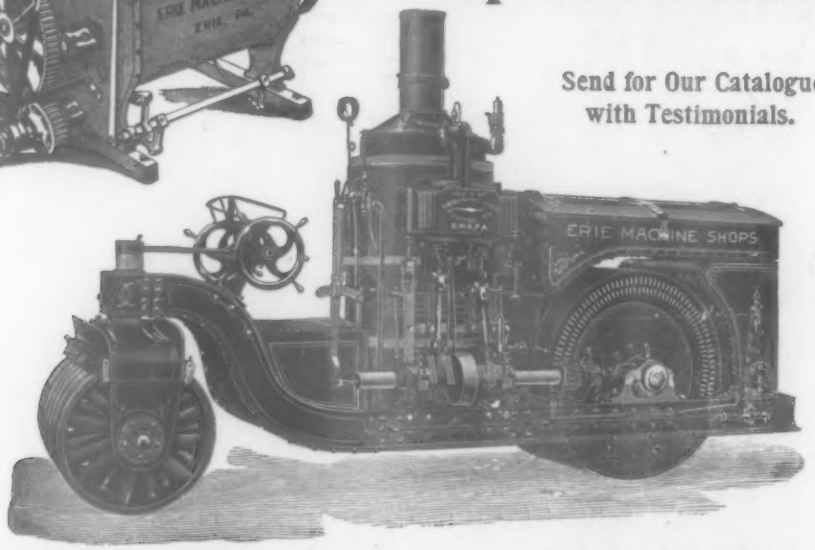

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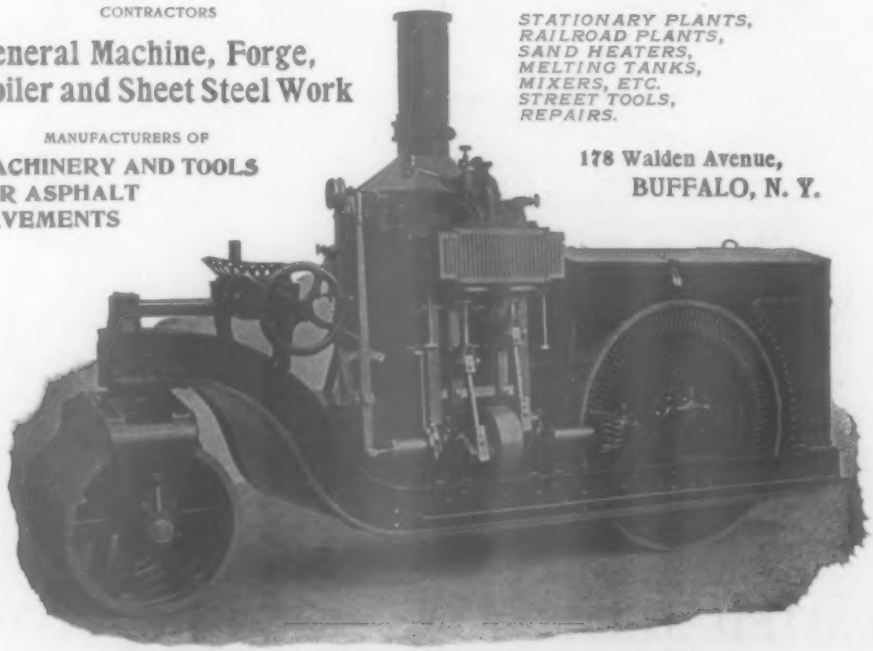

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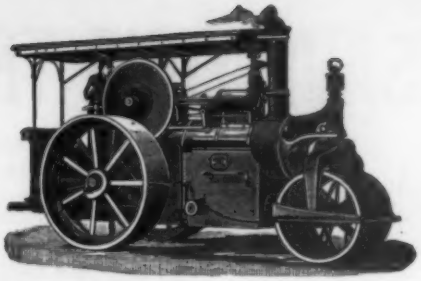

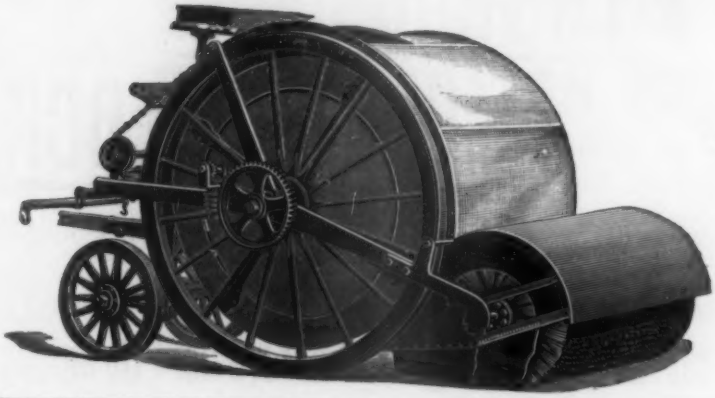

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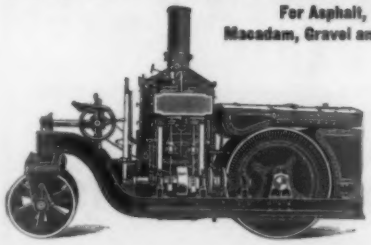

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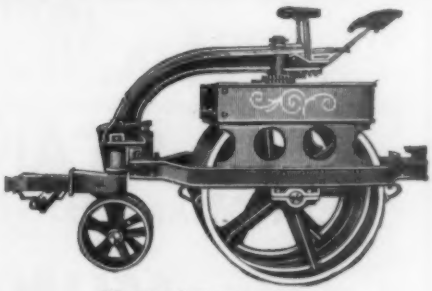

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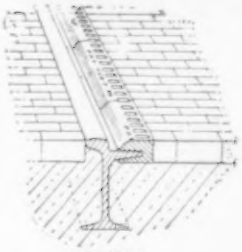

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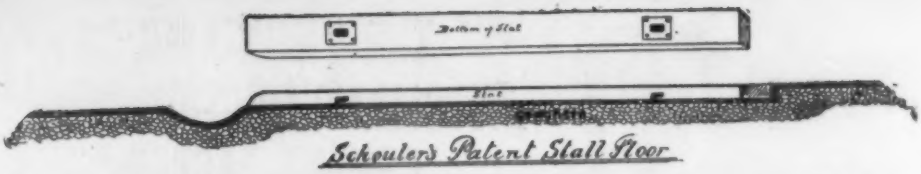

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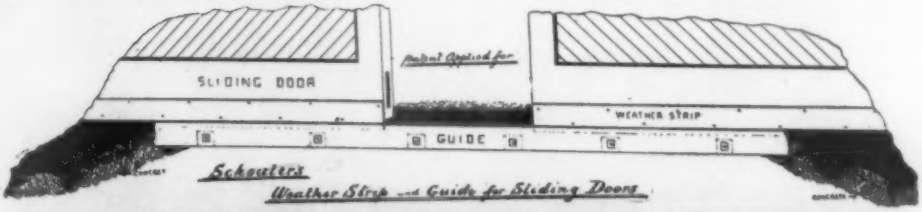

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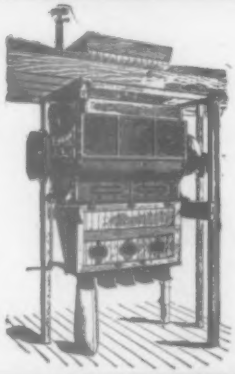

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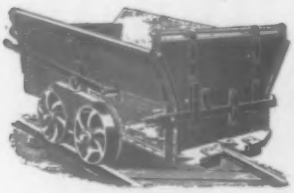

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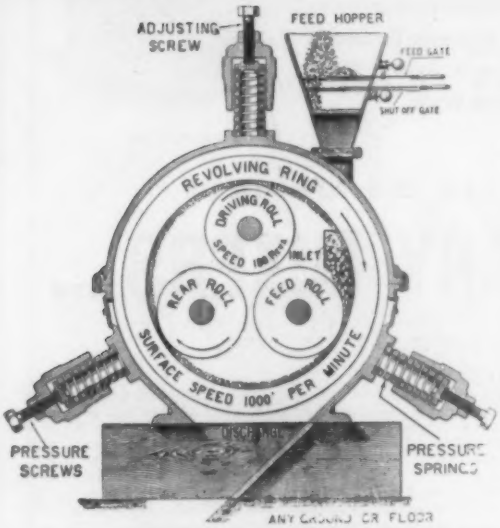

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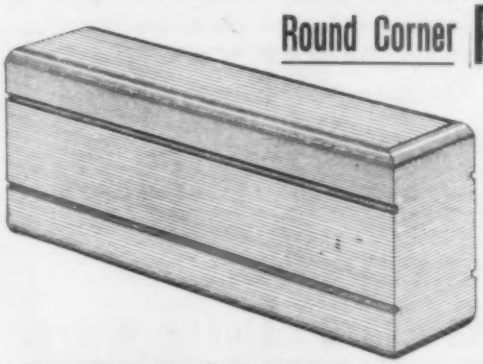

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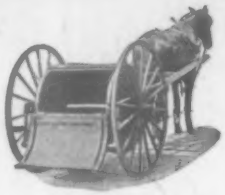

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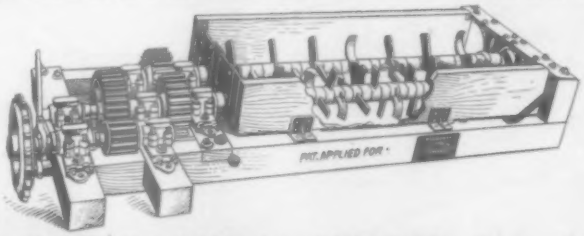

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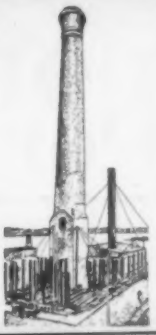

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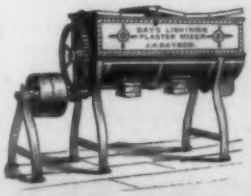

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E. B. Warren & Co., Washington, D. C.

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Studebaker Bros. Mfg. Co., South Bend, Ind.
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Austin & Western Co., Ltd., Chicago, Ill.
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Evens & Howard, St. Louis, Mo.
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Royal Sewer Pipe & Fire Brick Co., Akron, O.
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Clearfield Clay Working Co., Clearfield, Pa.
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Evens & Howard, St. Louis, Mo.
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Kentucky Fire Brick Co., Portsmouth, O.
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Michigan Sewer Pipe Co., Jackson, Mich.
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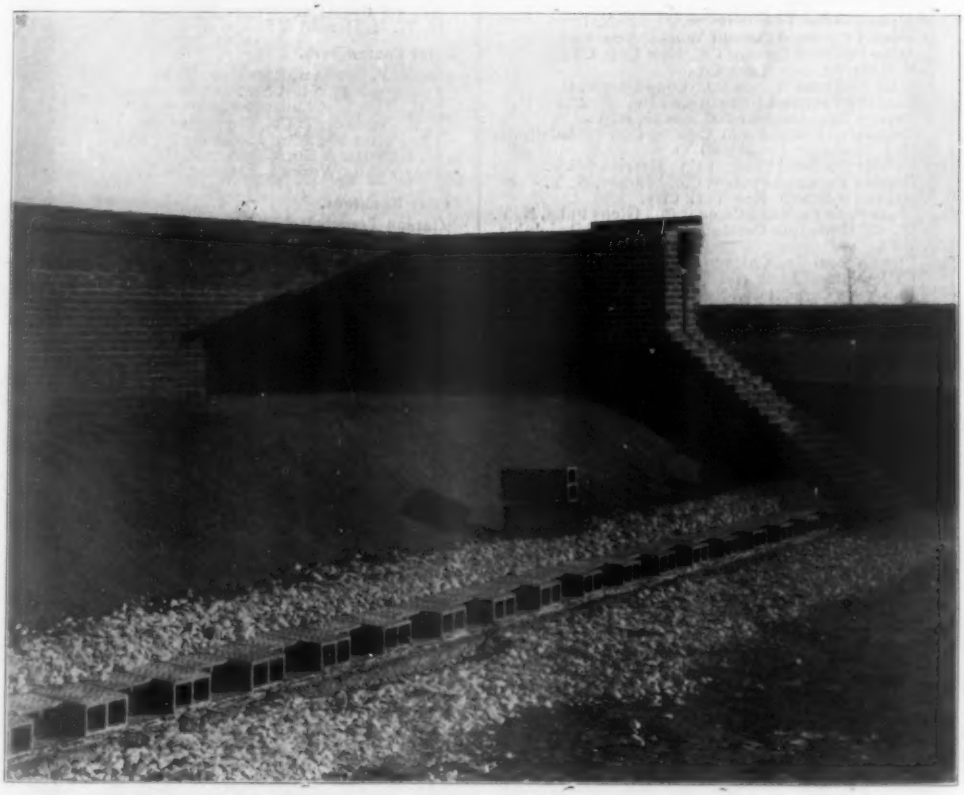

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Buckeye Portland Cement Co., Bellefontaine, O.
Cayuga Lake Cement Co., Ithaca, N. Y.
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Empire Portland Cement Co., Warner, N. Y.
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Glens Falls Portland Cement Co., Glens Falls, N. Y.
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Lawrence Cement Co., New York City.
Lesley & Trinkle, Philadelphia, Pa.
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Meacham & Wright, Chicago, Ill.
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New Jersey Portland Cement Co., Perth Amboy, N. J.
Omega Portland Cement Co., Jonesville, Mich.
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Syracuse Chilled Plow Co., Syracuse, N. Y.

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Monmouth Mining and Mfg. Co., Monmouth, Ill.
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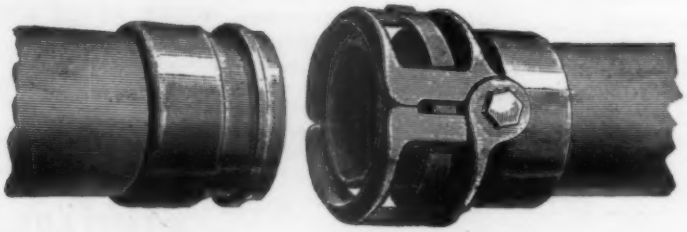

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Syracuse Chilled Plow Co., Syracuse, N. Y.
Wiard Plow Co., Batavia, N. Y.

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Brilliant Gas Lamp Co., Chicago, Ill.
Cleveland Vapor Light Co., Cleveland, O.
Reserve Foundry & Mfg. Co., Cleveland, O.

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Syracuse Chilled Plow Company, Syracuse, N. Y.
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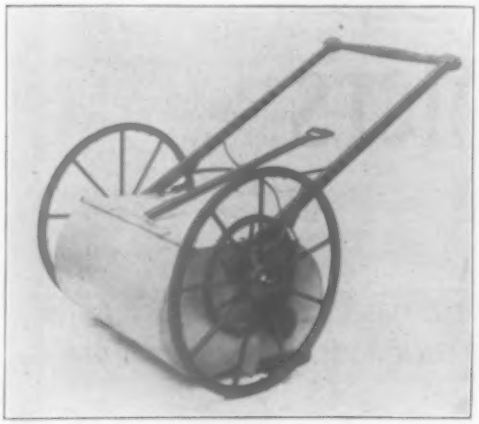

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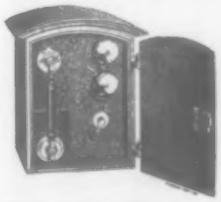

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Syracuse Chilled Plow Company, Syracuse, N. Y.

Wheel Scrapers.

Austin & Western Co., Ltd., Chicago, Ill.
W. H. Anderson & Sons, Detroit, Mich.
Queen City Supply Co., Cincinnati, O.
Syracuse Chilled Plow Company, Syracuse, N. Y.

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Niles Mine & Mill Supply Co., Cleveland, O.

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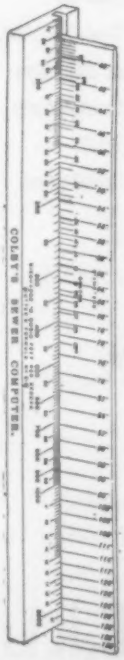

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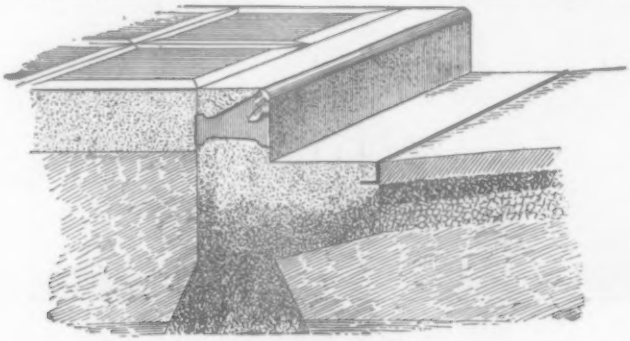

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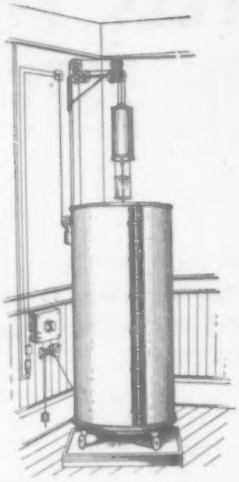

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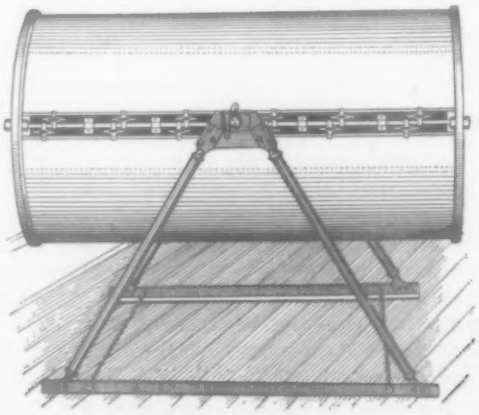

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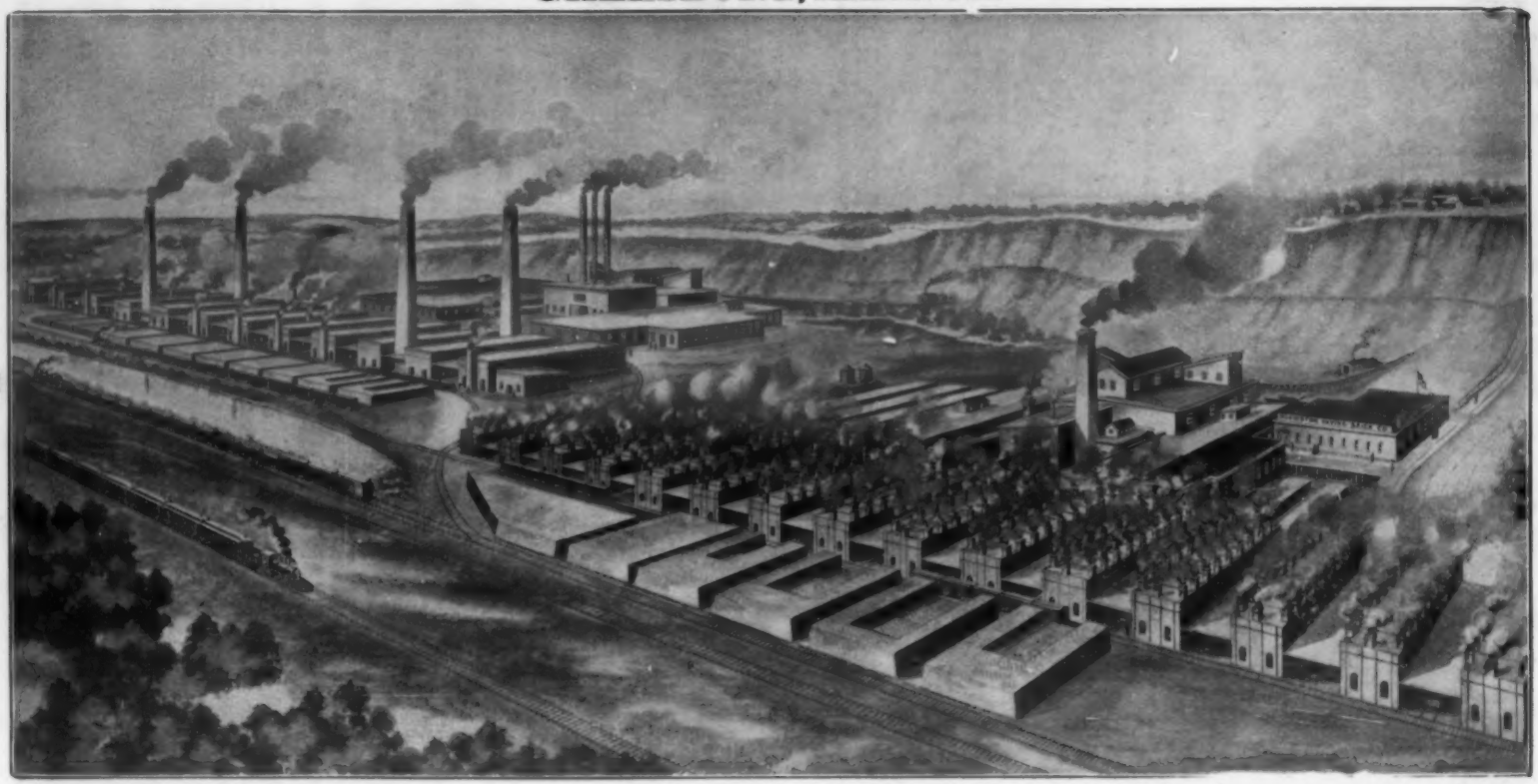

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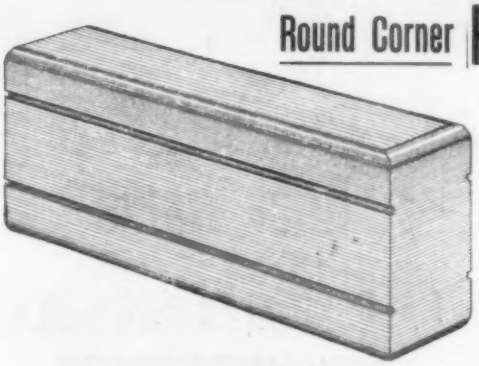

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POSITION WANTED.—Water-Works Engineer, graduated from European school, 33 years of age, desires position either as chief or first assistant in large water-works. Familiar with every class of modern instruments and pumping machinery; expert on artesian wells and pneumatic pumping systems. Ten years' practical experience; seven years in this country. G. B. 33, care MUNICIPAL ENGINEERING CO.

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FOR SALE.—Mr. John A. McDowell, of Columbus, Ohio, has a Cement Testing Machine and a fine Chemical Balance for sale. Write him.

FAIRMONT, W. VA., WATER-WORKS IMPROVEMENTS.

Sealed proposals will be received by the City Council of Fairmont, W. Va., until eight o'clock P. M., September 15, 1902, for the contemplated improvements to the existing water-works system, involving labor and furnishing of materials and apparatus.

Bids will be received for the construction and installation complete, with and without furnishing pipe, hydrants, valves, boiler, pump and certain other material or apparatus, and for parts of the work complete with and without certain material and apparatus, and for cast-iron pipe, hydrants, valves, pump, boiler, etc., the city reserving the right to accept such bid or bids as may be deemed best; to reject any one or all of them, and in any event to notify all bidders of such action as may be taken on or before September 25, 1902, until which date all proposals must remain open subject to the city's acceptance at the prices given.

The improvements contemplate—

1st—Seven miles, more or less, of new cast-iron pipe lines from 16 to 4 inches in diameter, including 12-inch flexible joint line under the Monongahela river; furnishing and connecting about 50 hydrants, necessary gates, valves, boxes, other apparatus, and connecting all to present system as planned.

2d—The construction of million-gallon masonry, or larger, reservoir of puddled and dry embankment, or steel or wrought-iron tank of 300,000 or 500,000 gallons capacity, at option of city.

3d—Increasing capacity of two existing steel tanks, 40 feet in diameter by 20 feet high, by addition of plates increasing height.

4th—The installation of one 150-horse-power boiler connected up with present boilers ready for use, on foundations prepared by the city.

5th—The installation of one one-and-one-half-million compound non-condensing steam pump capable of pumping against 439 feet head through 3,000 feet of 12-inch cast-iron main with 22 feet suction lift, or similar pump, 9,000 feet, 12-inch, 450 feet head.

6th—The construction of metal and slate or other roof over, and making other improvements to, pumping station recently damaged by fire.

7th—The construction of filter-beds for UPWARD or DOWNWARD filtration; aeration fountain; receiving basin, connections and appurtenances, with and without necessary sand and gravel.

9th—Furnishing of sand and gravel required for filter-beds.

10th—Other material and labor.

Bids contemplating part payment for new pump by purchase of two one-half million pumps, in good condition, will be given first consideration.

Likewise any bid contemplating part payment by purchase of two one-half-million pumps or present million-gallon pressure filter plant and connections, will be given favorable consideration.

Pumps and filter plant are in good order and working condition, and abandoned because of the

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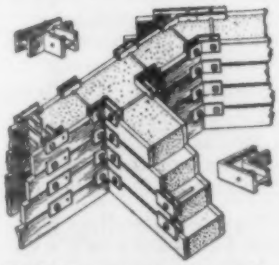
COMBINED BOX-CAP AND SHOE-PLANK HOLDERS



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city's rapid development demanding changes in method of operation of water-works system.

Cash or certified check to the amount of at least 5% of contract, payable to A. L. Lehman, mayor, must accompany, in same envelope, each proposal involving labor or labor and material, unless a bidder has submitted more than one proposal, in which case cash or certified check to the amount of at least five per cent. of largest proposed contract will be sufficient. Though contract, with approved bond, will be required of successful bidders, manufacturers or selling agents of established reputation need not inclose cash or check with their bid.

In the event of failure to enter contract, if requested to do so, the bidder agrees that the cash or check inclosed becomes the property of the city of Fairmont, W. Va.

Plans and specifications can be seen at the engineer's office in Fairmont, W. Va., or at the office of Joseph B. Rider, Consulting Engineer, 10 Wall St., New York, or South Norwalk, Conn., on and after September 2, 1902. Estimated quantity sheets will be forwarded on application. Copies of plans and specifications will be forwarded on receipt of $10, one-half of which will be returned on receipt of the plans and specifications, if returned on or before October 1, 1902.

Eastern bidders can leave proposals with the Consulting Engineer up to 6 P. M. September 15.

GEORGE E. KISNER,
W. M. FLEMING,
J. C. MCKINNEY,
Water Committee.
JOS. P. FLEMING, Clerk.
J. M. PRICKETT, City Eng'r.
JOSEPH B. RIDER,
10 Wall St., New York, and So. Norwalk, Conn.,
Consulting Engineer.

WARNING TO INFRINGERS OF HOLLOW CONCRETE BUILDING BLOCK PATENTS.

Notice is hereby given that all makers or users of hollow concrete building blocks are liable for damages and royalties, and all such buildings erected will be held for the same unless licensed by Harmon S. Palmer, the patentee and owner of all rights of the following patents: Hollow concrete building blocks, patented May 28, 1901; machine for molding hollow concrete building blocks, patented May 25, 1899. Any machine using removable bottom plates on which the block is molded will be prosecuted. Send for illustrated catalogue and patent papers, H. S. Palmer, Washington, D. C.

H. S. PALMER.

NOTICE TO CONTRACTORS.

Sealed proposals will be received at Indianapolis, Indiana, until 10 a. m., September 10, 1902 for constructing a local sewer in the first alley east of Keystone avenue, from Michigan to St. Clair street, with a lateral in St. Clair street.

The board of public works reserves the right to reject any or all bids.

HAROLD C. MCGREW,
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Board of Public Works.

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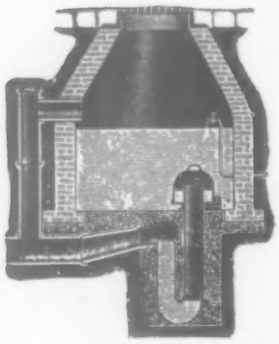

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No Moving Parts. No Valves. No Small Tubes to Clog or Choke.

Nothing Whatever to Get Out of Order.

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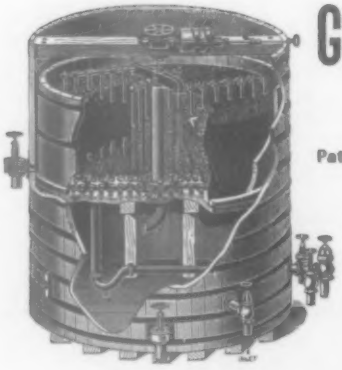

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They are all new machines, just completed, ready for immediate delivery. For detailed description and prices (bona fide intending users only),

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A system applicable alike to the largest centers of population, villages and private country residences.

PATENTS: The process of septic treatment in open or closed tanks. Fittings and apparatus for same.
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HAS FOUR ENAMELED STEEL SIGNS
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Indestructible Except by Violence.
LEGIBLE ARTISTIC ORNAMENTAL
Price Reasonable, Considering What is Offered

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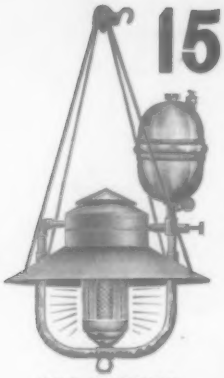

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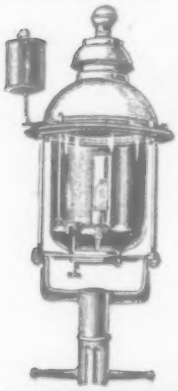

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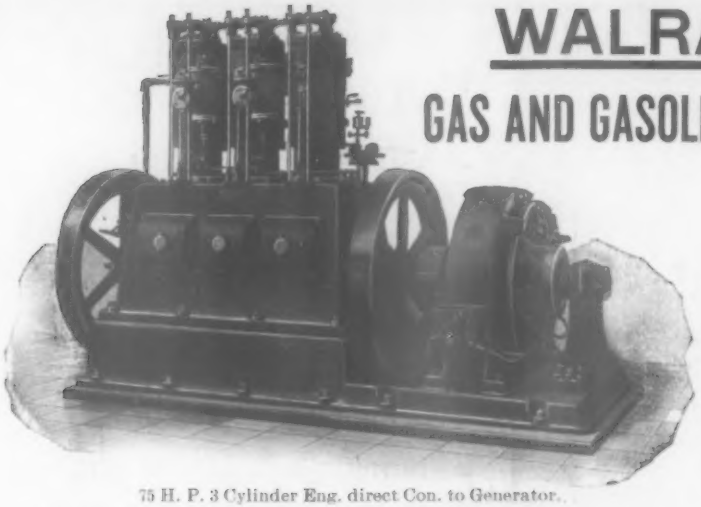

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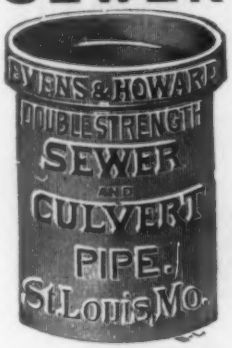

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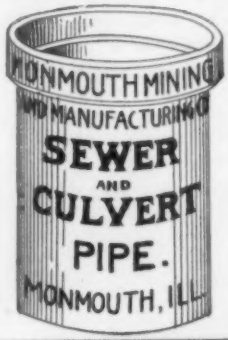

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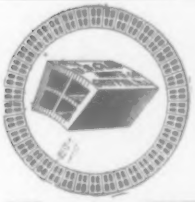

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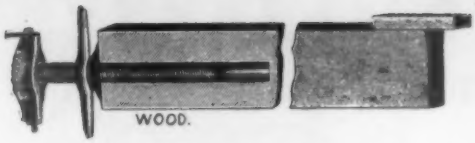

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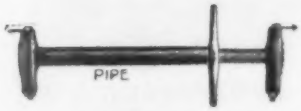

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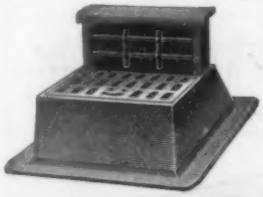

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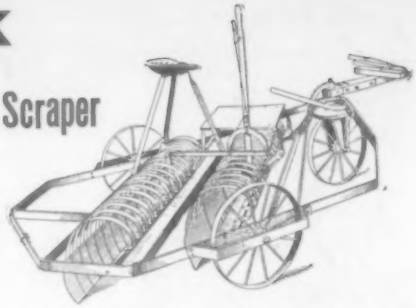

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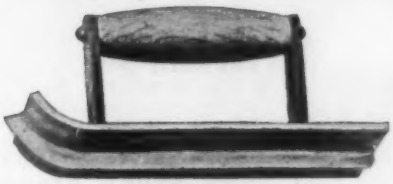

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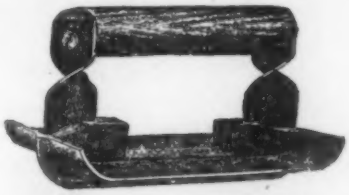

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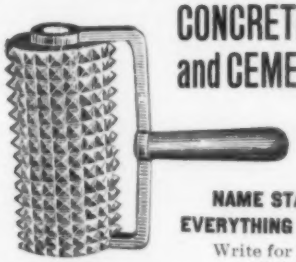

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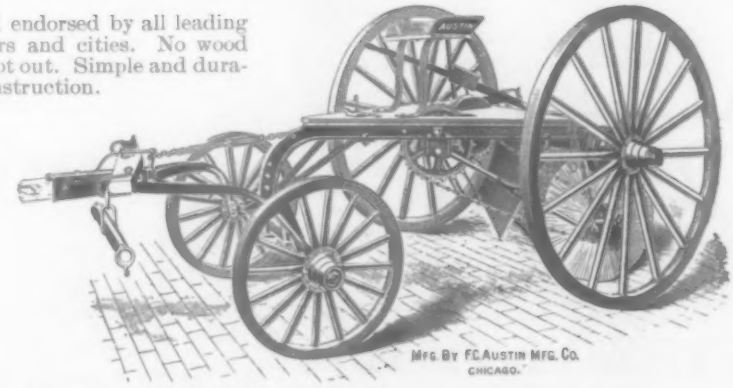

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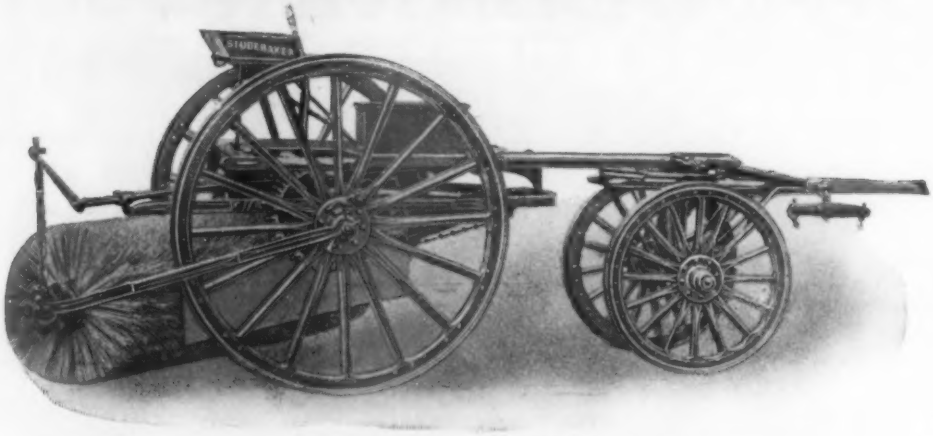

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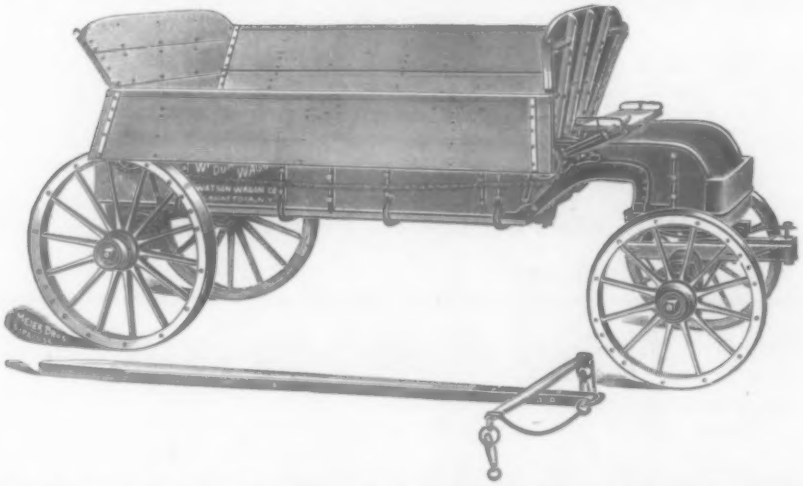

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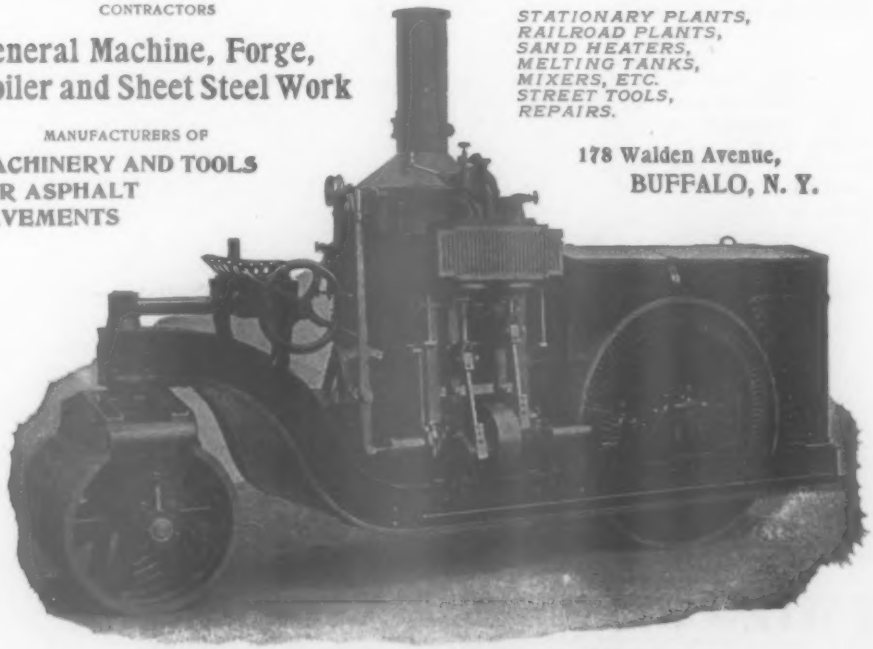

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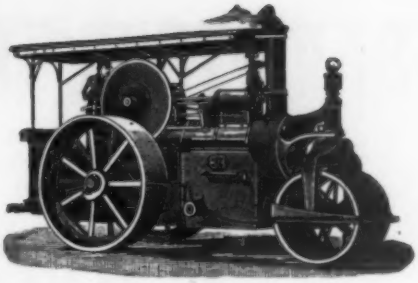

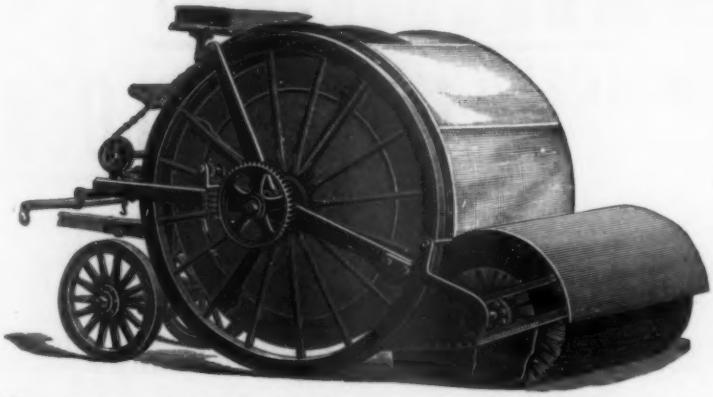

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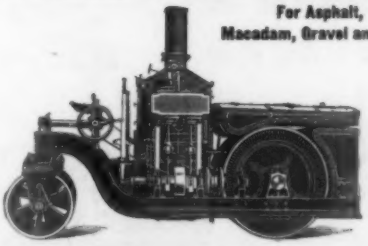

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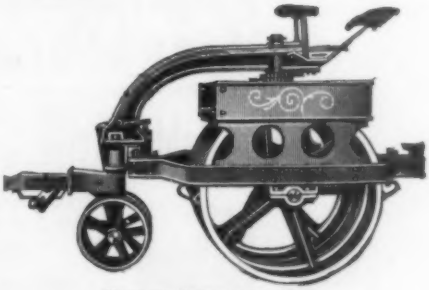

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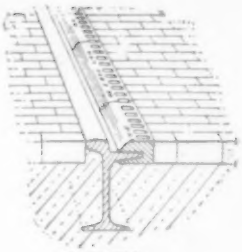

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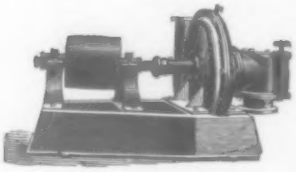

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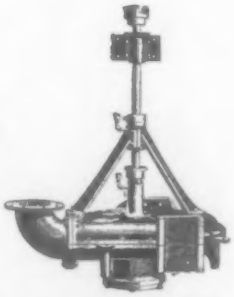

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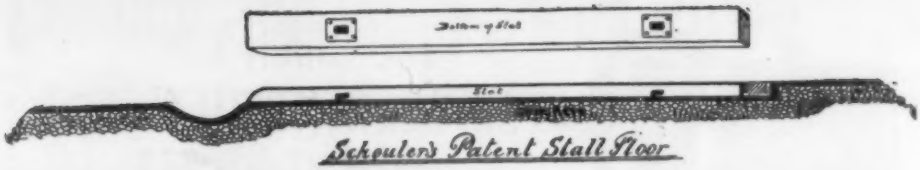

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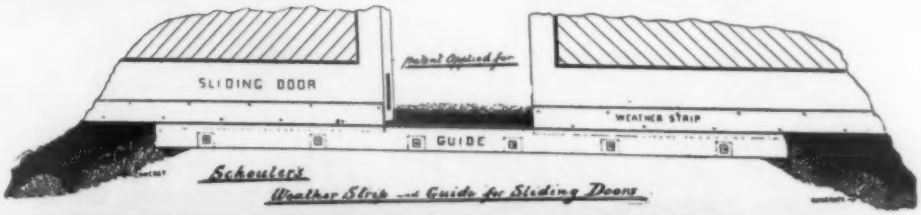

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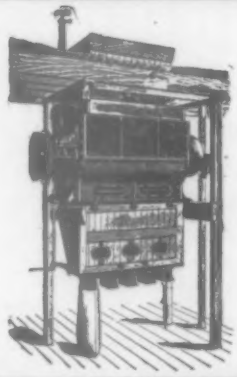

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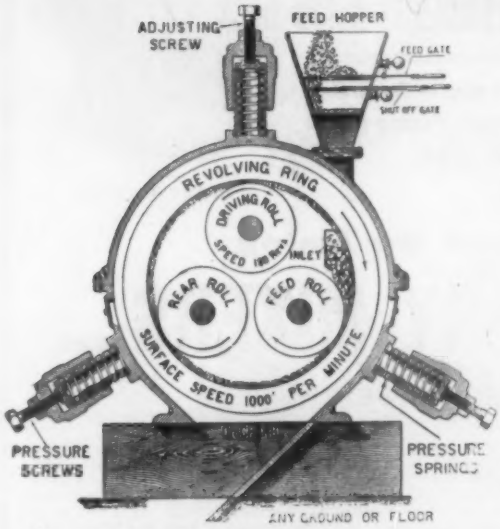

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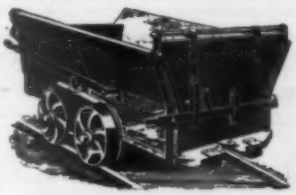

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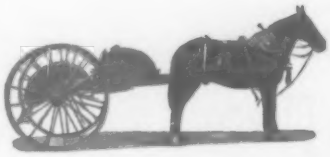

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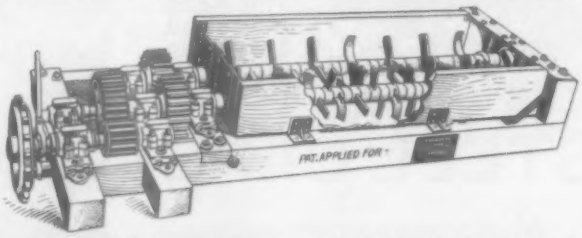

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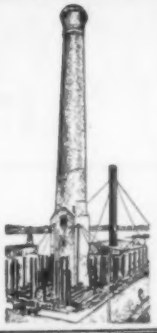

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The Barber Asphalt Paving Co., New York City.
T. Hugh Boorman, New York, N. Y.
Densmore Stabler Refining Co., Los Angeles, Cal.
Joseph J. Duffy & Co., Chicago, Ill.
Gabriel & Schall, New York City.
Globe Asphalt Co., Pittsburg, Pa.
Green River Asphalt Co., St. Louis, Mo.
Otto E. C. Guelich, Detroit, Mich.
Hercules Oil Refining Co., Los Angeles, Cal.
Jewett & Blodgett Oil Co., Bakersfield, Cal.
Charles W. Saacke, New York City.
W. S. P. Shields, Philadelphia, Pa.
The Sicilian Asphalt Paving Co., New York.
Southern Refining Co., Los Angeles, Cal.
Union Oil Co., San Francisco, Cal.
Uvalde Asphalt Co., New York City.
Warren Asphalt Paving Co., Utica, N. Y.
Western Paving and Supply Co., Indianapolis, Ind.

Asphalt (Brunswick) Importers.
Gabriel & Schall, New York City.

Asphalt Blocks.
Lake Erie Asphalt Block Co., Toledo, O.
New Castle Asphalt Block Co., Pittsburg, Pa.

Asphalt Machinery.
Drake Standard Machine Works, Chicago, Ill.
Iroquois Iron Works, Buffalo, N. Y.
Robert Hooke, Chattanooga, Tenn.
Julian Scholl & Co., New York City.
Toledo Asphalt Patcher Co., Toledo, O.

Asphalt Mixers.
Erie Machine Shop, Erie, Pa.
Iroquois Iron Works, Buffalo, N. Y.
Toledo Asphalt Patcher Co., Toledo, O.

Asphalt Pavements.
American Contracting Co., Ltd., Buffalo, N. Y.
Ayers Asphalt Paving Co., Zanesville, O.
Barber Asphalt Paving Co., New York.
R. F. Conway Co., Chicago, Ill.
Thomas L. Dooley, Chicago, Ill.
Joseph J. Duffy & Co., Chicago, Ill.
J. U. Fritchey, Lancaster, Pa.
Gilsonite Construction Co., St. Louis, Mo.
Green River Asphalt Co., St. Louis, Mo.
Otto E. C. Guelich, Detroit, Mich.
F. H. Kirchner & Co., Cincinnati, O.
John Lipps, Cincinnati, O.
Nelson Paving Co., Waco, Tex.
New Castle Asphalt Block Co., Pittsburg, Pa.
Charles W. Saacke, New York, N. Y.
Schillinger Bros. Co., Toledo, O.
W. S. P. Shields, Philadelphia, Pa.
The Sicilian Asphalt Paving Co., New York.
Warren Asphalt Paving Co., Utica, N. Y.
Warren Bros. Co., Boston, Mass.
Western Construction Co., Lafayette, Ind.
Western Paving & Supply Co., Indianapolis, Ind.

Asphalt Plants.
Erie Machine Shop, Erie, Pa.
Iroquois Iron Works, Buffalo, N. Y.
Toledo Asphalt Patcher Co., Toledo, O.

Asphalt Railroad Plants.
Iroquois Iron Works, Buffalo, N. Y.
Toledo Asphalt Patcher Co., Toledo, O.

Asphalt Repair Plant.
Robert Hooke, Chattanooga, Tenn.
Toledo Asphalt Patcher Co., Toledo, O.

Asphalt Sidewalks.
Warren Bros. Co., Boston, Mass.

Asphalt Tanks.
W. B. Scaife & Sons, Pittsburg, Pa.

Asphalt Tools.
W. H. Anderson & Sons, Detroit, Mich.
Contractors' Tool Company, Philadelphia, Pa.
F. H. Crafts, Rochester, N. Y.
Iroquois Iron Works, Buffalo, N. Y.
Orr & Lockett Hardware Co., Chicago, Ill.
Julian Scholl & Co., New York City.
Toledo Asphalt Patcher Co., Toledo, O.

Belting.
Queen City Supply Co., Cincinnati, O.

Bitulithic Pavements.
The Central Bitulithic Paving Co., Zanesville, O.
Hoosier Construction Co., Indianapolis, Ind.
Warren Bros. Co., Boston, Mass.
Warren Bros. Co., Philadelphia, Pa.

Bituminous Macadam.
The Central Bitulithic Paving Co., Zanesville, O.
Hoosier Construction Co., Indianapolis, Ind.
Warren Bros. Co., Boston, Mass.
Warren Bros. Co., Philadelphia, Pa.

Blue Print Copying Machines.
Pittsburg Blue Print Co., Pittsburg, Pa.

Blue Print Paper.
The H. Cole Co., Columbus, O.
Pittsburg Blue Print Co., Pittsburg, Pa.

Boilers.
Marinette Iron Works, Marinette, Wis.
W. B. Scaife & Sons, Pittsburg, Pa.

Bolting Screens.
Jeffrey Mfg. Co., Columbus, O.

Bridges.
Concrete Steel Engineering Co., New York City.
Wm. Fife & Son, Indianapolis, Ind.
Hollensbe Stone Co., Westport, Ind.
Wm. B. Scaife & Sons Co., Pittsburg, Pa.

Cars.
Cleveland Car Co., Cleveland, O.
Niles Mine & Mill Supply Co., Cleveland, O.

Castings.
Hennessy Foundry Company, Springfield, O.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.

Catch Basin Manufacturers.
Byram Foundry Co., Indianapolis, Ind.
Kramer Bros., Dayton, O.
H. W. McDonald & Son, Galion, O.

Cement.
Alpha Portland Cement Co., Alpha, N. J.
Alsen's Portland Cement Works, New York.
Atlas Portland Cement Co., New York City.
F. Behrend, New York City.
Brier Hill Coal & Iron Co., Youngstown, O.
Buckeye Portland Cement Co., Bellefontaine, O.
Cayuga Lake Cement Co., Ithaca, N. Y.
Commercial Wood and Cement Co., Philadelphia.
H. J. Conkling, Cincinnati, O.
Detroit Portland Cement Co., Detroit, Mich
Ellis-Blum Co., Meadville, Pa.
Empire Portland Cement Co., Warner, N. Y.
Gabriel & Schall, New York City.
Glens Falls Portland Cement Co., Glens Falls, N. Y
W. G. Hartranft Cement Company, Philadelphia, Pa.
Illinois Steel Co., Chicago, Ill.
Kelley Island Lime and Transport Co., Cleveland, O.
D. J. Kennedy, Pittsburg, Pa.
Lawrence Cement Co., New York City.
Lehigh Portland Cement Co., Allentown, Pa.
Lesley & Trinkle, Philadelphia, Pa.
Meacham & Wright, Chicago, Ill.
Michigan Alkali Company, Wyandotte, Mich.
Milwaukee Cement Co., Milwaukee, Wis.
New Jersey Portland Cement Co., Perth Amboy N. J.

Omega Portland Cement Co., Jonesville, Mich.
Peninsular Portland Cement Co., Jackson, Mich.
St. Louis Portland Cement Co., St. Louis, Mo.
T. W. Spinks, Covington, Ky.
Schaeffer & Gengnagel, Dayton, O.
Wabash Portland Cement Co., Detroit, Mich.
Charles Warner & Co., New York.
I. L. Van Natta & Co., Lafayette, Ind.

Cement Construction.

W. W. Benson, Terre Haute, Ind.
Beardstown Concrete Construction Co., Beardstown, Ill.
Standard Stone Co., Wilmington, Del.
Stevens Cast Stone Co., Chicago, Ill.

Cement Machinery.

C. O. Bartlett & Co., Cleveland, O.
The Bonnot Co., Canton, O.
Chambers Bros. Co., Philadelphia, Pa.
Cleveland Car Co., Cleveland, O.
Dodge Manufacturing Company, Mishawaka, Ind.
W. D. Dunning, Syracuse, N. Y.
S. Howes Co., Silver Creek, N. Y.
Jeffrey Mfg. Co., Columbus, O.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.
Kent Mill Co., New York.
Merchant & Co., Philadelphia, Pa.

Cement Packers.

S. Howes Co., Silver Creek, N. Y.

Cement Pans.

W. B. Scaife & Sons Co., Pittsburg, Pa.

Cement Paving.

American Art Tile Co., Columbus, Ohio.
Thos. L. Dooley, Chicago, Ill.
Gilsonite Construction Co., St. Louis, Mo.
Ohio Stone and Paving Company, Youngstown, O.
Rogers & Dunlop, Indianapolis, Ind.
M. C. Russell Cement Paving Co., Springfield, O.
W. H. Settle & Co., Cincinnati, O.

Cement Tools.

W. H. Anderson & Sons, Detroit, Mich.
Contractors' Tool Co., Philadelphia, Pa.
F. H. Crafts, Rochester, N. Y.
Orr & Lockett Hardware Co., Chicago, Ill.

Centrifugal Pumps.

Irvin Van Wie, Syracuse, N. Y.

Chemical Tests.

Booth, Garrett & Blair, Philadelphia, Pa.
Hassan, Tagge & Dean, Detroit, Mich.
Lathbury & Spackman, Philadelphia, Pa.
Pittsburg Testing Laboratory, Pittsburg, Pa.

Civil Engineers.

Chester E. Albright, Philadelphia, Pa.
C. C. Brown, Indianapolis, Ind.
Mason L. Brown, Detroit, Mich.
W. H. Bryan, St. Louis, Mo.
F. W. Cappelen, Minneapolis, Minn.
B. H. Colby, St. Louis, Mo.
John A. Cole & Son, Chicago, Ill.
Downey & Wilcox, Anderson, Ind.
Wm. H. Evers Engineering Co., Cleveland, O.
John P. Force, Columbus, O.
Howard Egleston, Havana, Cuba.
Gordon Engineering & Construction Co., Cincinnati, O.
C. G. H. Goss, Martinsville, Ind.
John J. Hainsworth, Indianapolis, Ind.
Hassan, Tagge & Dean, Detroit, Mich.
Hering & Fuller, New York, N. Y.
Ingram & Leftwich, Nashville, Tenn.
Iowa Engineering Co., Clinton, Iowa.
Jeup, Moore & Minor, Indianapolis, Ind.
John Lorentz, Hamilton, Ohio.
M. W. Kingsley, Cleveland, O.
Chester R. McFarland, Cleveland, O.
Dabney H. Maury, Peoria, Ill.
The Municipal Engineering Co. (Inc.), New York City.
George S. Pierson, Kalamazoo, Mich.
Ohio Engineering Company, Elyria, O.
Clement L. Reamer, Newark, O.
Walter P. Rice Engineering Co., Cleveland, O.
S. Bent Russell, St. Louis, Mo.
Shedd & Sarle, Providence, R. I.
W. S. Shields, Chicago, Ill.
Snow & Barbour, Columbus, O.
I. B. Stuart, Pittsburg, Pa.
R. H. Tingley, Providence, R.
Walter R. Toy, Lima, O.
M. Tschirgi, Jr., Dubuque, Iowa.
Wardle & Yeager, Cedar Rapids, Iowa.
Waring, Chapman & Farquhar, New York, N. Y.
Wise & Watson, Passaic, N. J.
Frank W. Wood, Chicago, Ill.

Clay-Working Machinery.

The Bonnot Co., Canton, O.
Chambers Bros. Co., Philadelphia, Pa.
Cleveland Car Co., Cleveland, O.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.

Clay Products.

American Clay Mfg. Co. of N. J., Pittsburg, Pa.
H. J. Conkling, Cincinnati, O.
Ferris Brick Co., Mechanicsville, N. Y.
Reese-Hammond Fire Brick Co., Bolivar, Pa.

Coal and Coke.

Schaeffer & Gengnagel, Dayton, O.

Coal Tar.

E. B. Warren & Co., Washington, D. C.
Warren Bros. Co., Boston, Mass.
Warren Bros. Co., Philadelphia, Pa.

Combined Curb and Gutter.

D. C. Buntin, Indianapolis, Ind.
H. A. Lensing, Evansville, Ind.
Harry C. McKay, Cincinnati, O.
M. C. Russell Cement Paving Co., Springfield, O.
W. H. Settle & Co., Cincinnati, O.
Warren Bros. Co., Boston, Mass.

Concrete Mixers.

A. B. Black, Concord, N. H.
Chambers Bros Co., Philadelphia, Pa.
Contractors Plant Co., Boston, Mass.
Drake Standard Machine Works, Chicago, Ill.
W. D. Dunning, Syracuse, N. Y.
Fisher & Saxton Co., Washington, D. C.
Jeffrey Mfg. Co., Columbus, O.
Julian Scholl & Co., New York City.

Concrete Steel Arch Bridges.

Concrete Steel Engineering Co., New York City.

Concrete Work.

James W. Ball, Wyncote, Pa.
W. W. Benson, Terre Haute, Ind.
Beardstown Concrete Construction Co., Beardstown, Ill.
S. W. Coombs & Son, Cedar Falls, Ia.
Thos. L. Dooley, Chicago, Ill.
J. G. Hutchinson, Hamilton, O.
H. A. Lensing, Evansville, Ind.
John A. McGarry & Co., Chicago, Ills.
Standard Stone Co., Wilmington, Del.
Stevens Cast Stone Co., Chicago, Ill.
Warren Bros. Co., Boston, Mass.

Contractors.

American Art Tile Co., Columbus, Ohio.
James W. Ball, Wyncote, Pa.
Thos. Bridges' Sons, Wabash, Ind.
D. C. Buntin, Indianapolis, Ind.
The Central Bitulithic Paving Co., Zanesville, O.
City Wastes Disposal Co., New York City.
Cleveland Silex Stone Co., Detroit, Mich.
R. F. Conway Co., Chicago, Ill.
H. G. Coldwell, Indianapolis, Ind.
Thos. L. Dooley, Chicago, Ill.
Joseph J. Duffy & Co., Chicago, Ill.
Wm. Fife & Son, Indianapolis, Ind.
Fielding & Shepley, St. Paul, Minn.
Jas. P. Graham, Brooklyn, N. Y.
Otto E. C. Guelich, Detroit, Mich.
J. U. Fritchey, Lancaster, Pa.
Gilsonite Construction Co., St. Louis, Mo.
Gordon Engineering and Construction Co., Cincinnati, O.
J. H. Green & Son, Appleton, Wis.

Hoosier Construction Co., Indianapolis, Ind.
J. G. Hutchinson, Hamilton, O.
Ingram & Leftwich, Nashville, Tenn.
F. H. Kirchner & Co., Cincinnati, Ohio.
H. A. Lensing, Evansville, Ind.
John Lipps, Cincinnati, O.
John A. McGarry & Co., Chicago, Ill.
Harry C. McKay, Cincinnati, O.
J. H. Marden Cement Paving Co., La Crosse, Wis.
Nashville Roofing & Paving Co., Nashville, Tenn.
Nelson Paving Co., Waco, Tex.
A. G. Pugh, Columbus, O.
Rogers & Dunlop, Indianapolis, Ind.
M. C. Russell Cement Paving Co., Springfield, O.
Schillinger Bros. Co., Toledo, O.
B. M. & J. F. Shanley, Philadelphia, Pa.
W. H. Settle & Co., Cincinnati, O.
Smith, Moss & Brown, Chicago, Ill.
Standard Paving Co., Newark, N. J.
Troy Public Works Co., Utica, N. Y.
Chas. H. Warford & Co., Dayton, O.
Wright & Childers, Grammer, Ind.

Contractors and Builders.

J. G. Hutchinson, Hamilton, O.

Contractors' Supplies.

E. T. Adams, Detroit, Mich.
Cleveland Car Co., Cleveland, Ohio.
H. J. Conkling, Cincinnati, O.
Ellis-Blum Co., Meadville, Pa.
Queen City Supply Co., Cincinnati, O.
Schaeffer & Gengnagel, Dayton, O.
Chas. H. Warford & Co., Dayton, O.
E. B. Warren & Co., Washington, D. C.

Contractors' Wagons.

Studebaker Bros. Mfg. Co., South Bend, Ind.
D. S. Watson, Canastota, N. Y.

Contractors' Tools and Machinery.

W. H. Anderson & Sons, Detroit, Mich.
Austin & Western Co., Ltd., Chicago, Ill.
A. B. Black, Concord, N. H.
Contractors' Plant Co., Boston, Mass.
F. H. Crafts, Rochester, N. Y.
Queen City Supply Co., Cincinnati, O.
Contractors' Tool Company, Philadelphia, Pa.
Orr & Lockett Hardware Co., Chicago, Ill.
Julian Scholl & Co., New York City.
Syracuse Chilled Plow Co., Syracuse, N. Y.
Wiard Plow Co., Batavia, N. Y.

Conveyors.

C. O. Bartlett & Co., Cleveland, O.
Carson Trench Machine Co., Boston, Mass.
Dodge Manufacturing Company, Mishawaka, Ind.
The Jeffrey Mfg. Co., Columbus, O.
Niles Mine and Mill Supply Co., Niles, O.
Syracuse Chilled Plow Company, Syracuse, N. Y.

Corrugated Iron and Steel.

Niles Mine & Mill Supply Co., Cleveland, O.
W. B. Scaife & Sons Co., Pittsburg, Pa.

Creosoted Wood Block.

Hoosier Construction Co., Indianapolis, Ind.
Republic Chemical and Creosoting Co., Indianapolis, Ind.
Terre Haute Creosoting Co., Terre Haute, Ind.

Crushers, Rock and Ore.

Austin & Western Co., Ltd., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
Julian Scholl & Co., New York City.
Kent Mill Co., New York.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.

Crushed Stone.

Thos. Bridges' Sons, Wabash, Ind.
Cleveland Stone Co., Chicago, Ill.

Culvert Pipe, Vitrified.

American Clay Mfg. Co. of N. J., Pittsburg, Pa.
Buckeye Fire Clay Co., Uhrichsville, O.
H. J. Conkling, Cincinnati, O.
Evens & Howard, St. Louis, Mo.
Mecca Clay Works, Mecca, Parke Co., Ind.
Michigan Sewer Pipe Co., Jackson, Mich.
Monmouth Mining and Mfg. Co., Monmouth, Ill.
Royal Sewer Pipe & Fire Brick Co., Akron, O.
H. Stevens' Sons Co., Macon, Ga.
U. S. Clay Mfg. Co., Griffin, Ill.
Thos. L. Dooley, Chicago, Ill.

Curbing.

James W. Ball, Wyncote, Pa.
D. C. Buntin, Indianapolis, Ind.
Cleveland Stone Company, Cleveland, O.
Jas. P. Graham, Brooklyn, N. Y.
Hollensbe Stone Co., Westport, Ind.
H. A. Lensing, Evansville, Ind.
Harry C. McKay, Cincinnati, O.
Ohio Stone and Paving Co., Youngstown, O.
Rogers & Dunlop, Indianapolis, Ind.
W. H. Settle & Co., Cincinnati, O.
Warren Bros. Co., Boston, Mass.

Derricks.

Queen City Supply Co., Cincinnati, O.

Drain Tile.

H. J. Conkling, Cincinnati, O.
D. J. Kennedy, Pittsburg, Pa.
Michigan Sewer Pipe Co., Jackson, Mich.
Royal Sewer Pipe & Fire Brick Co., Akron, O.

Drawing Papers.

Pittsburg Blue Print Co., Pittsburg, Pa.

Dryers.

Cleveland Car Co., Cleveland, O.
Iroquois Iron Works, Buffalo, N. Y.

Dump Cars.

Cleveland Car Co., Cleveland, O.
Niles Mine & Mill Supply Co., Cleveland, O.

Dump Wagons.

Studebaker Bros. Mfg. Co., South Bend, Ind.
United States Sanitary Co., Washington, D. C.
Watson Wagon Co., Canastota, N. Y.

Electrical Supplies.

W. Grant Thorpe, Newburgh, N. Y.

Electrolytic Investigations.

Dabney H. Maury, Peoria, Ill.

Engines, Portable and Stationary.

Marinette Iron Works, Marinette, Wis.
Queen City Supply Co., Cincinnati, O.

Filtration Plant.

Wm. B. Scaife & Sons Co., Pittsburg, Pa.

Feed Water Plants.

Wm. B. Scaife & Sons Co., Pittsburg, Pa.

Fire Alarm Telegraph.

Gamewell Fire Alarm Telegraph Co., New York.

Fire Brick.

American Clay Mfg. Co. of N. J., Pittsburg, Pa.
Clearfield Clay Working Co., Clearfield, Pa.
H. J. Conkling, Cincinnati, O.
Evens & Howard, St. Louis, Mo.
Kentucky Fire Brick Co., Portsmouth, O.
Michigan Sewer Pipe Co., Jackson, Mich.
Reese-Hammond Fire Brick Co., Bolivar, Pa.
Royal Sewer Pipe & Fire Brick Co., Akron, O.
H. Stevens' Sons Co., Macon, Ga.

Fire Clay Products.

American Clay Mfg. Co. of N. J., Pittsburg, Pa.
Buckeye Fire Clay Co., Uhrichsville, O.
Clearfield Clay Working Co., Clearfield, Pa.
H. J. Conkling, Cincinnati, O.
Evens & Howard, St. Louis, Mo.
Ferris Brick Co., Mechanicsville, N. Y.
Kentucky Fire Brick Co., Portsmouth, O.
Mecca Clay Works, Mecca, Parke Co., Ind.
Michigan Sewer Pipe Co., Jackson, Mich.
Monmouth Mining and Mfg. Co., Monmouth, Ill.
Reese-Hammond Fire Brick Co., Bolivar, Pa.
The Royal Sewer Pipe & Fire Brick Co., Akron, O.
H. Stevens' Sons Co., Macon, Ga.
J. L. Van Natta & Co., Lafayette, Ind.

Fire Wagons.

Robert Hooke, Chattanooga, Tenn.

Flagging.

Cleveland Stone Co., Cleveland, O.
Hollensbe Stone Co., Westport, Ind.

BUSINESS DIRECTORY—CONTINUED.

Flint Pebbles.
John D. McGlincey, New York, N. Y.

Flue Liners.
American Clay Mfg. Co. of N. J., Pittsburg, Pa.
H. J. Conkling, Cincinnati, O.
Royal Sewer Pipe & Fire Brick Co., Akron, O.

Flush Tanks.
Pacific Flush Tank Co., Chicago, Ill.

Garbage Carts.
United States Sanitary Co., Washington, D. C.

Garbage Disposal Plants.
City Wastes Disposal Co., New York City.
The Municipal Engineering Co. (Inc.), New York City.

Gas Engines.
August Mietz, New York City.
Marinette Iron Works Mfg. Co., Marinette, Wis.

Hoisters.
W. H. Anderson & Sons, Detroit, Mich.
C. O. Bartlett & Co., Cleveland, O.
Carson Trench Machine Co., Boston, Mass.
Potter Mfg. Co., Indianapolis, Ind.

Hollow Block Machinery.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.

Hose Coupling.
The W. J. Clark Co., Salem, O.

Hydraulic Cement.
H. J. Conkling, Cincinnati, O.
Meacham & Wright, Chicago, Ill.
Milwaukee Cement Co., Milwaukee, Wis.

Hydraulic Rams.
Power Specialty Co., New York.

Incandescent Lamps.
W. Grant Thorpe, Newburgh, N. Y.

Iron Paving Block.
American Street Railway Paving & Improvement Co., Springfield, Mass.

Kerosene Engines.
August Mietz, New York City.

Lamps, Gas and Gasoline.
Brilliant Gas Lamp Co., Chicago, Ill.
Cleveland Vapor Light Co., Cleveland, O.
Reserve Foundry & Mfg. Co., Cleveland, O.

Landscape Engineers.
Mason L. Brown, Detroit, Mich.

Lawn Mowers.
Clipper Lawn Mower Co., Norristown, Pa.

Lime.
H. J. Conkling, Cincinnati, O.
A. H. Lauman, Pittsburg, Pa.

Locomotives.
H. K. Porter Co., Pittsburg, Pa.

Macadam and Concrete Stone.
B. M. & J. F. Shanley, Philadelphia, Pa.

Macadamizing.
James W. Ball, Wyncote, Pa.
James P. Graham Brooklyn, N. Y.
Troy Public Works Co., Utica, N. Y.
Warren Bros. Co., Boston, Mass.
Wright & Childers, Grammer, Ind.

Marbleithic Flooring.
The Marbleithic Co., Dayton, O.

Mechanical Engineers.
W. H. Bryan, St. Louis, Mo.
Dabney H. Maury, Peoria, Ill.

Municipal Lighting.
Abner Acetylene Gas Co., Chicago, Ill.
Brilliant Gas Lamp Co., Chicago, Ill.
Cleveland Vapor Light Co., Cleveland, O.
John Lorenz, Hamilton, Ohio.
Reserve Foundry & Mfg. Co., Cleveland, O.

Paving Blocks.
Clinton Paving and Building Brick Company, Clinton, Ind.
Kentucky Fire Brick Co., Portsmouth, O.
Metropolitan Paving Brick Co., Canton, O.
Purington Paving Brick Co., Galesburg, Ill.
Roseville Brick and Terra Cotta Co., Roseville, O.
Saginaw Clay Mfg. Co., Saginaw, E. S., Mich.
Springfield Paving Brick Co., Springfield, Ill.

Paving Brick.
American Clay Mfg. Co. of N. J., Pittsburg, Pa.
Clearfield Clay Working Co., Clearfield, Pa.
Clinton Paving and Building Brick Co., Clinton, Ind.
Colinwood Shale Brick Co., Colinwood, Ohio.
W. S. Dickey Clay Mfg. Co., Kansas City, Mo.
Ferris Brick Co., Mechanicsville, N. Y.
Galesburg Paving Brick Company, Galesburg, Ill.
Kentucky Fire Brick Co., Portsmouth, O.
Metropolitan Paving Brick Co., Canton, O.
Moore, E. H., Chicago, Ill.
Purington Paving Brick Co., Galesburg, Ill.
Reese-Hammond Fire Brick Co., Bolivar, Pa.
Roseville Brick and Terra Cotta Co., Roseville, O.
Saginaw Clay Mfg. Co., Saginaw, E. S., Mich.
Sangamo Brick Company, Springfield, Ill.
Scranton Vitrified Brick and Tile Company, Scranton, Pa.
Springfield Paving Brick Co., Springfield, Ill.
Wabash Clay Mfg. Co., Veedersburg, Ind.

Paving Brick Machinery.
Chambers Bros. Co., Philadelphia, Pa.
Cleveland Car Co., Cleveland, Ohio.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.

Paving, Cement Sidewalk.
H. G. Coldwell, Indianapolis, Ind.
S. W. Coombs & Son, Cedar Falls, Ia.
Thos. L. Dooley, Chicago, Ill.
Ohio Stone & Paving Co., Youngstown, O.
Rogers & Dunlop, Indianapolis, Ind.

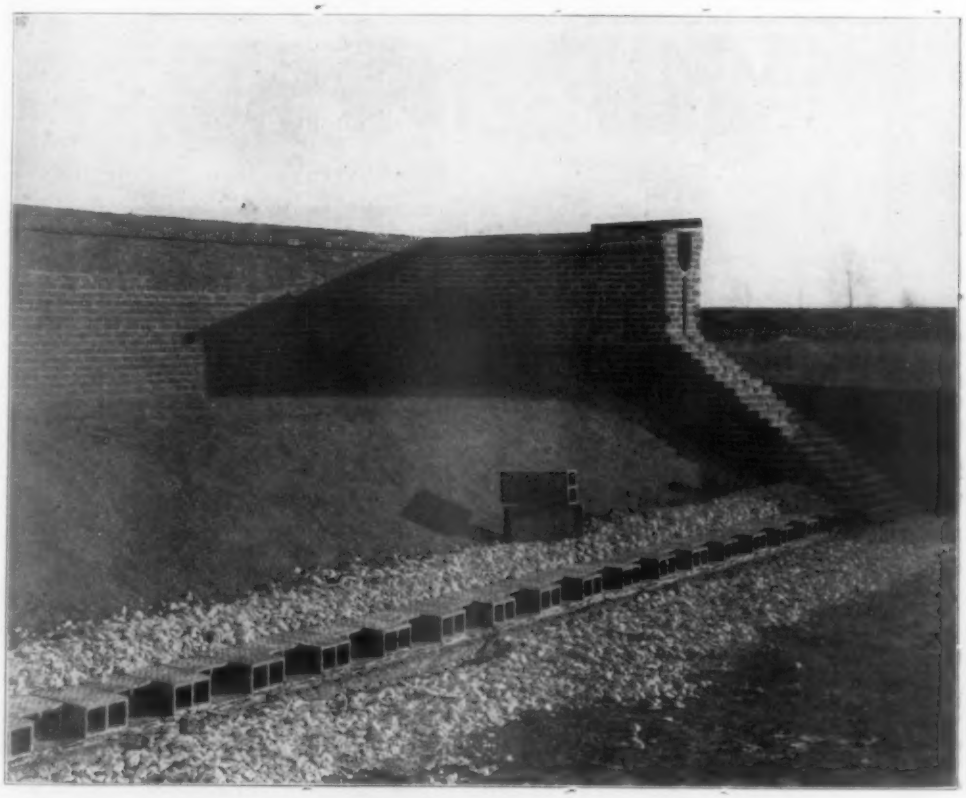
Paving Contractors.
James W. Ball, Wyncote, Pa.
The Central Bitulithic Paving Co., Zanesville, O.
Cleveland Silex Stone Co., Detroit, Mich.
H. G. Coldwell, Indianapolis, Ind.
R. F. Conway Co., Chicago, Ill.
Thos. L. Dooley, Chicago, Ill.
Joseph J. Duffy & Co., Chicago, Ill.
Jas. P. Graham, Brooklyn, N. Y.
Fielding & Shepley, St. Paul, Minn.
J. U. Fritchey, Lancaster, Pa.
Gilsonite Construction Co., St. Louis, Mo.
J. H. Green & Son, Appleton, Wis.
Hoosier Construction Co., Indianapolis, Ind.
Ingram & Leftwich, Nashville, Tenn.
F. H. Kirchner & Co., Cincinnati, O.
Lake Erie Asphalt Block Co., Toledo, O.
J. H. Marden Cement Paving Co., La Crosse, Wis
John A. McGarry & Co., Chicago, Ill.
Nashville Roofing & Paving Co., Nashville, Tenn.
Nelson Paving Co., Waco, Tex.
A. G. Pugh, Columbus, O.
Republic Chemical & Creosoting Co., Indianapolis, Ind.
M. C. Russell Cement Paving Co., Springfield, O.
Schillinger Bros. Co., Toledo, O.
W. H. Settle & Co., Cincinnati, O.
Smith, Moss & Brown, Chicago, Ill.
Standard Paving Co., Newark, N. J.
Troy Public Works Co., Utica, N. Y.
Western Construction Co., Lafayette, Ind.
Western Paving & Supply Co., Indianapolis, Ind.
Warren Asphalt Paving Co., Utica, N. Y.
Warren Bros. Co., Boston, Mass.

Paving Pitch.
Ellis-Blum Co., Meadville, Pa.
E. B. Warren & Co., Washington, D. C.

THE UNITED STATES SAND FILTRATION COMPANY

CONSTRUCTORS OF

SLOW SAND FILTRATION SYSTEMS



PATENTED

METHOD OF CONSTRUCTION

Our method of construction reduces the first cost to that of mechanical filtration, and all parts are prominent. No coagulant is used and cost of cleaning is reduced to a minimum as manual labor is dispensed with.

INDIANAPOLIS AND NEW YORK

BUSINESS DIRECTORY—CONTINUED.

Paving Tools.

W. H. Anderson & Sons, Detroit, Mich.
Contractors' Tool Company, Philadelphia, Pa.
F. H. Crafts, Rochester, N. Y.
Iroquois Iron Works, Buffalo, N. Y.
Orr & Lockett Hardware Co., Chicago, Ill.
Julian Scholl & Co., New York City.

Pipe, Riveted Steel.

W. B. Scaife & Sons, Pittsburg, Pa.

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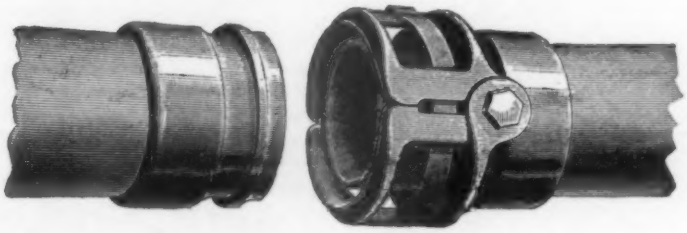

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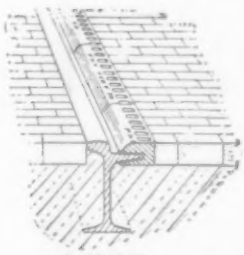

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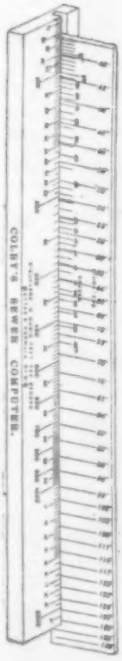

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Vol. 17,	No. 1,	July 1899
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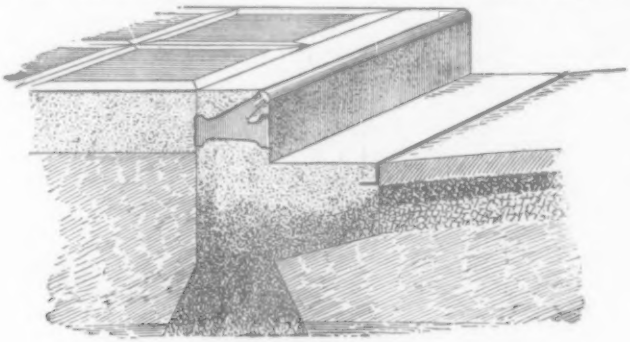

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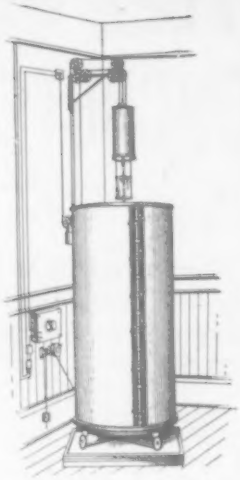

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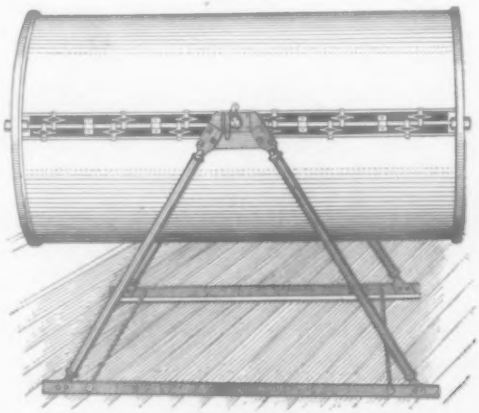

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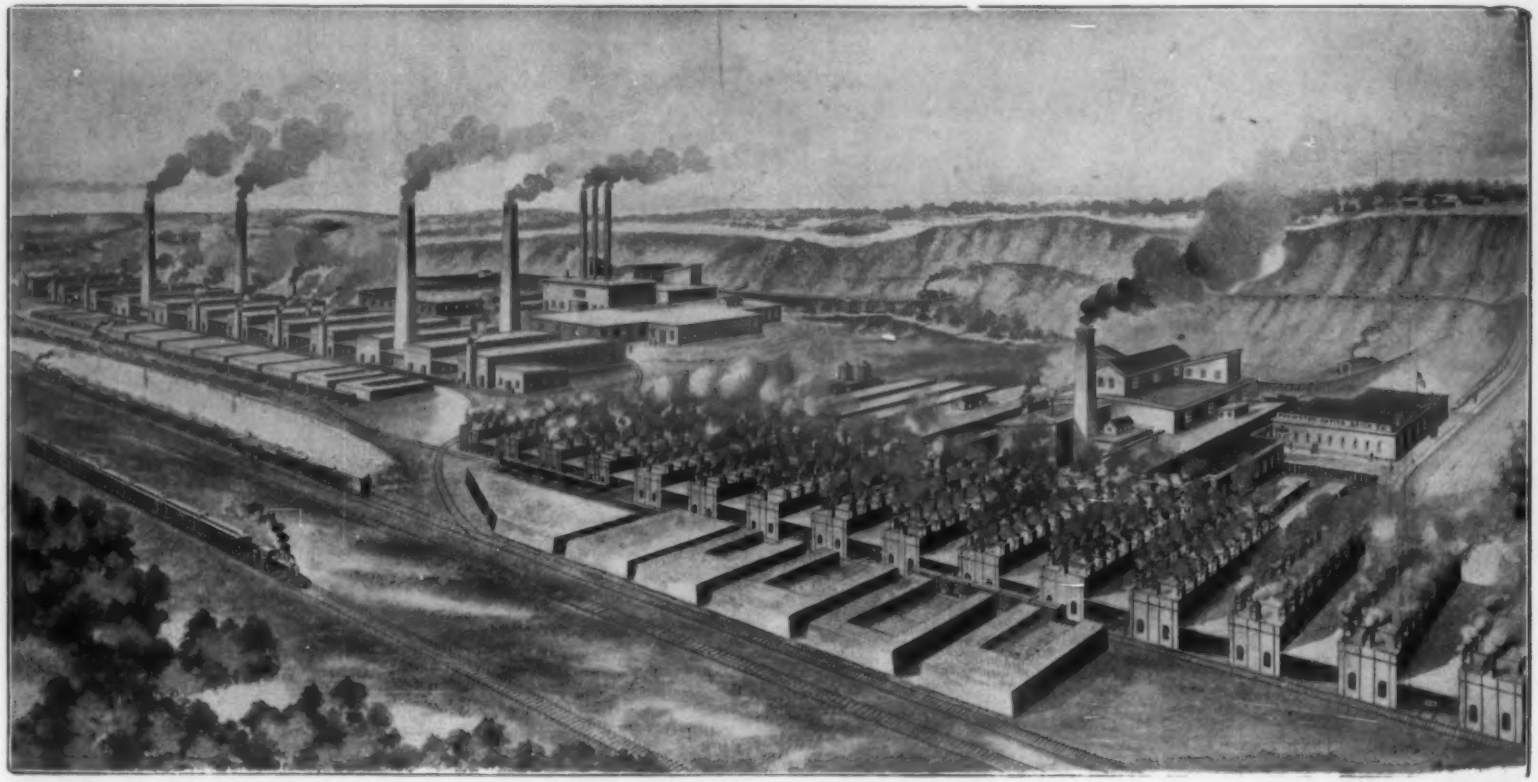

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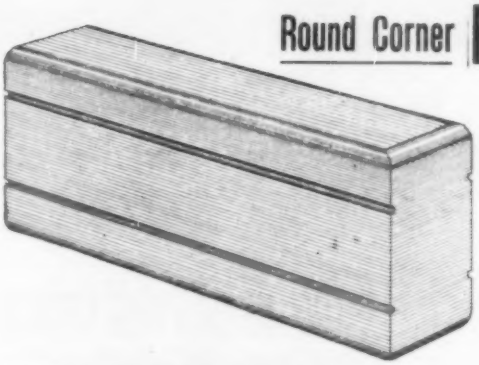

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FOR SALE.—Mr. John A. McDowell, of Columbus, Ohio, has a Cement Testing Machine and a fine Chemical Balance for sale. Write him.

PROPOSALS.

To water-works contractors—Sealed bids will be received by the city clerk of El Paso, Texas, up to the hour of noon of October 22, A. D. 1902, for the supplying of the city of El Paso, its inhabitants and its enterprises with wholesome water for the period of thirty-five years, said bids to be thereafter opened and acted upon by the said city council of the city of El Paso, said water to be procured from what is known as the Mesa, near Fort Bliss military reservation, near El Paso, Texas. The city of El Paso, if any bid is accepted, is to grant a franchise running for a period of thirty-five years to the accepted bidder, and said franchise to be so granted to have in same, and to contain in same, such conditions, stipulations, agreements, regulations, provisos, etc., as the city council of the city of El Paso shall deem fit, proper, expedient and necessary; said franchise, if so granted to the accepted bidder, to give him the right to lay mains, conduits, pipes, etc., along the streets, alleys, highways, parks and lanes of the city, and to authorize said accepted bidder to make all necessary and proper connections and operation of said water-works plant; said franchise to reserve the right in behalf of the city of El Paso to purchase such plant as shall be constructed at any time after the end of ten years thereafter, and the price to be paid to be agreed upon by arbitration; said franchise to provide that the system of piping, conduits, etc., is to be installed under the direction of the city council of the city of El Paso and a competent engineer, and the whole plant to be constructed in a thorough and up-to-date manner, according to plans and specifications to be agreed upon between the accepted bidder and the city council. Each bidder hereunder is required to deposit with the mayor of the city of El Paso, Texas, a certified check for the sum of $5,000, which said sum is to be forfeited should the accepted bidder fail to enter into a contract with the city of El Paso within ten days after his bid has been accepted. The right is reserved to reject any bid, or all bids, or to accept any bid. For further information address the city clerk of El Paso.

B. F. HAMMET,
Mayor of the City of El Paso, Texas.

Attest: J. A. ESCAJEDA, City Clerk.

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NOTICE TO CONTRACTORS.

Sealed bids will be received at Indianapolis, Ind., until October 3, 1902, for building cement walks on Harrison street, from English avenue to Noble street; Wilcox street, from Belmont avenue to Lynn street.

Sealed bids will be received until October 8, for cement walks on Senate avenue, from 32d to 33d streets; Meridian street, from 34th to 38th; Washington street, from Maple to Central avenues; Central avenue, from Washington street to Lowell avenue; Lowell avenue, from Maple to Central avenues.

Sealed bids are asked until October 15 for building a main sewer in Roosevelt, Valley and Brookside avenues, and Rural, Urbana and 19th streets; for cement walks on St. Peter street; for grading, graveling and rolling the roadways and building cement walks on North and Wilson streets.

The Board of Public Works reserves the right to reject any or all bids.

HAROLD C. MEGREW,
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CHARLES MAGUIRE,
Board of Public Works.

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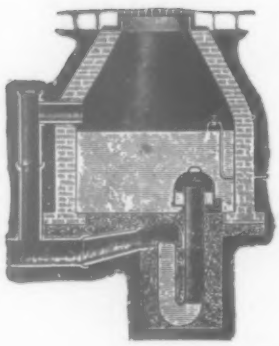

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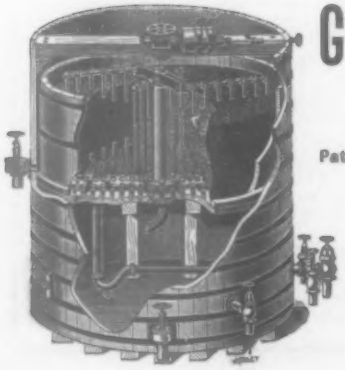

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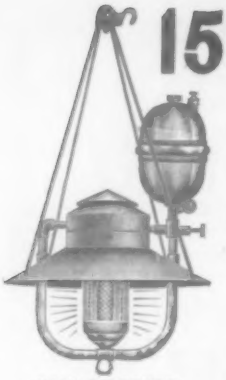

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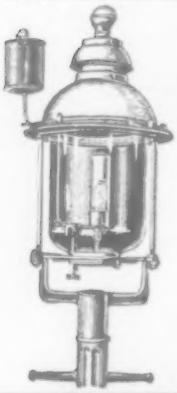

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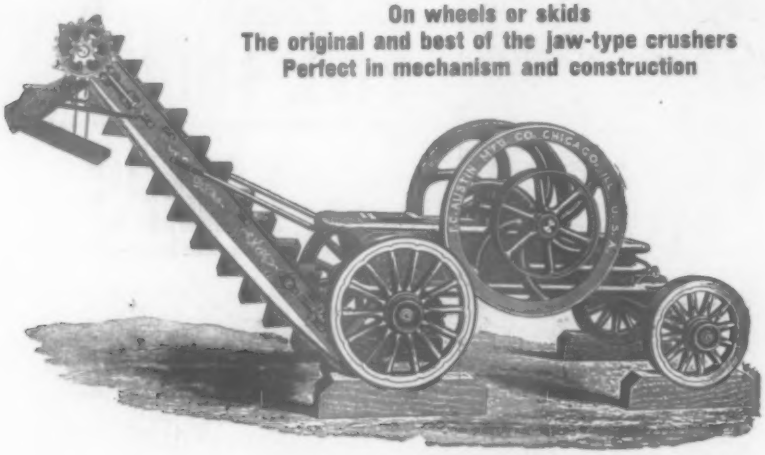

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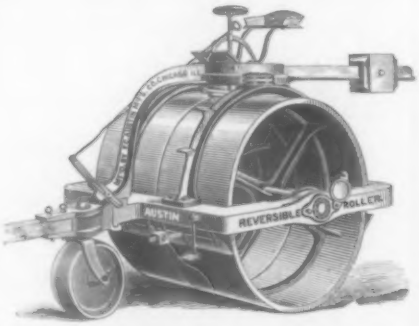

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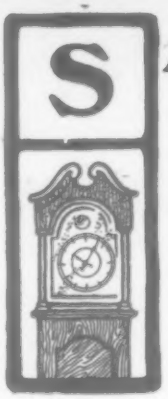

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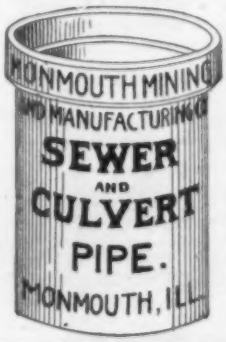

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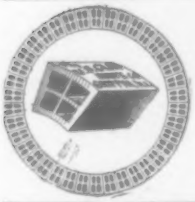

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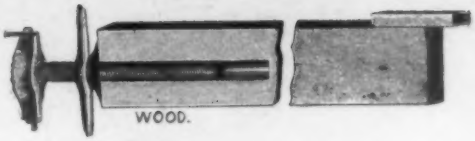

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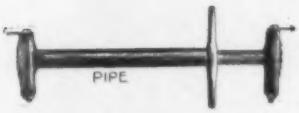

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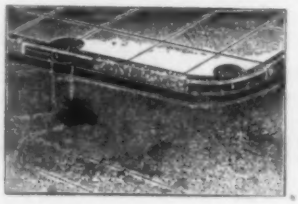

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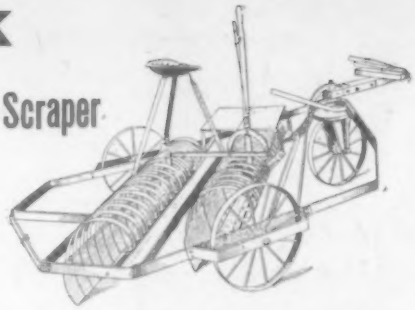

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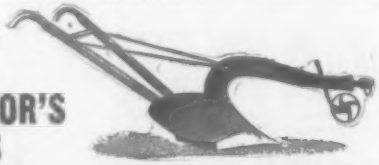

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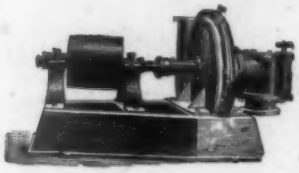

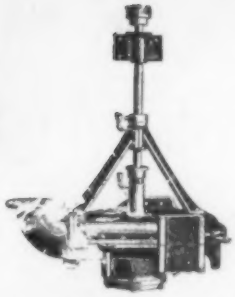

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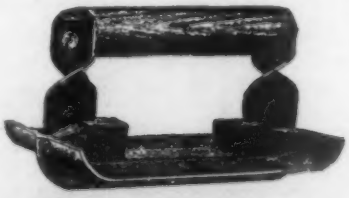

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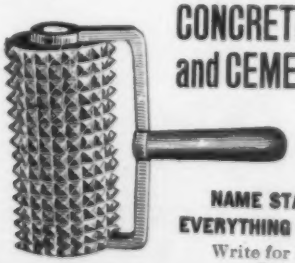

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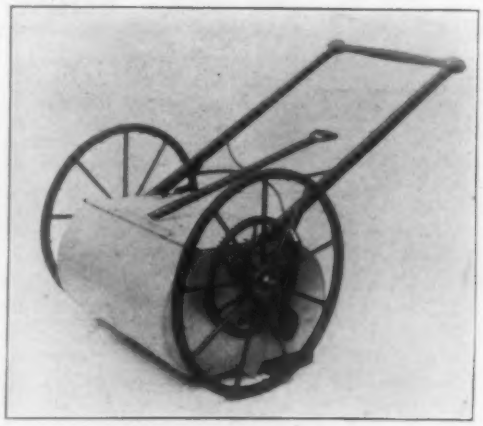

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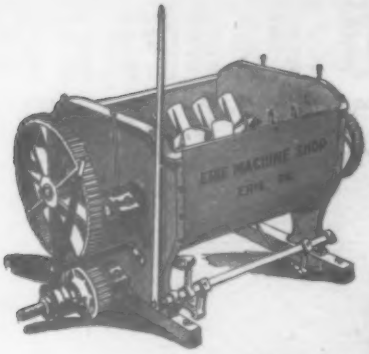

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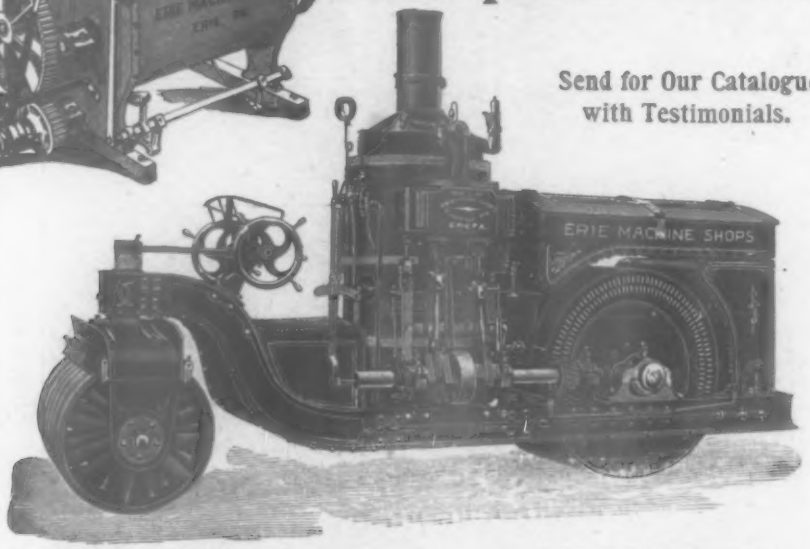

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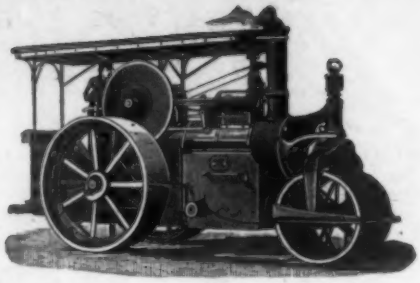

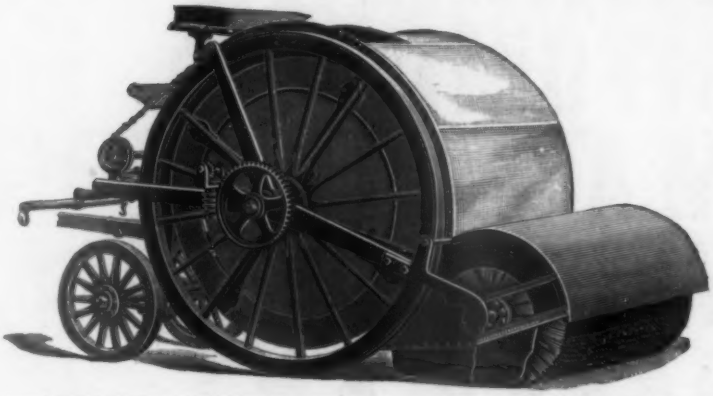

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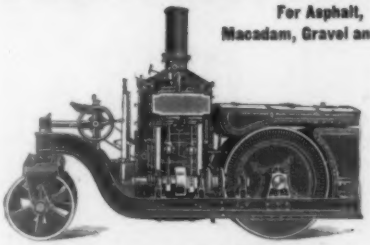

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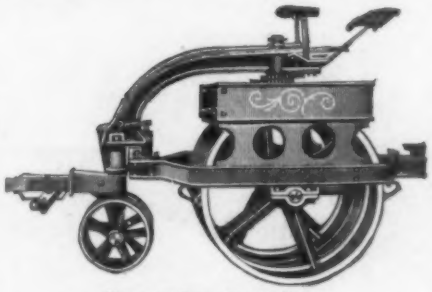

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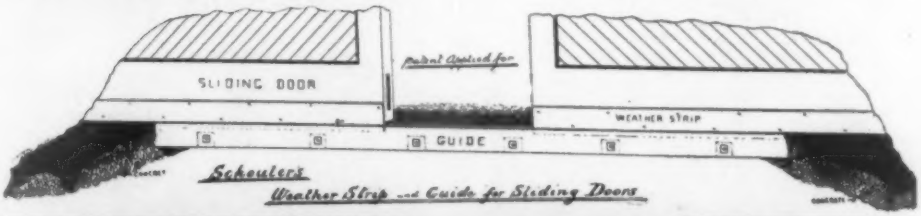

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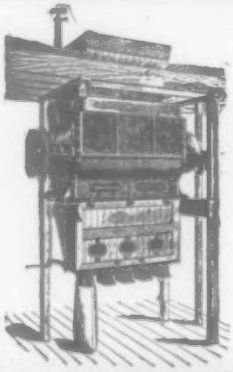

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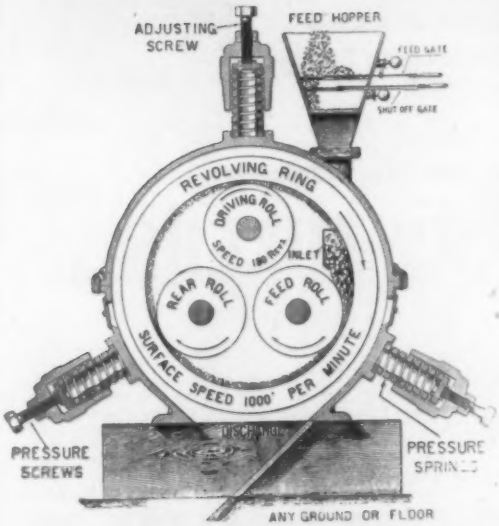

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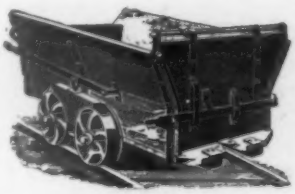

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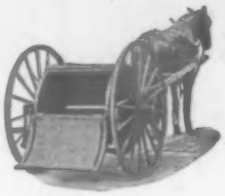

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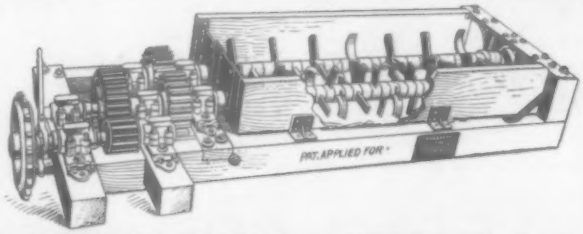

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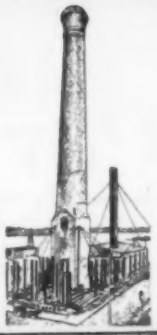

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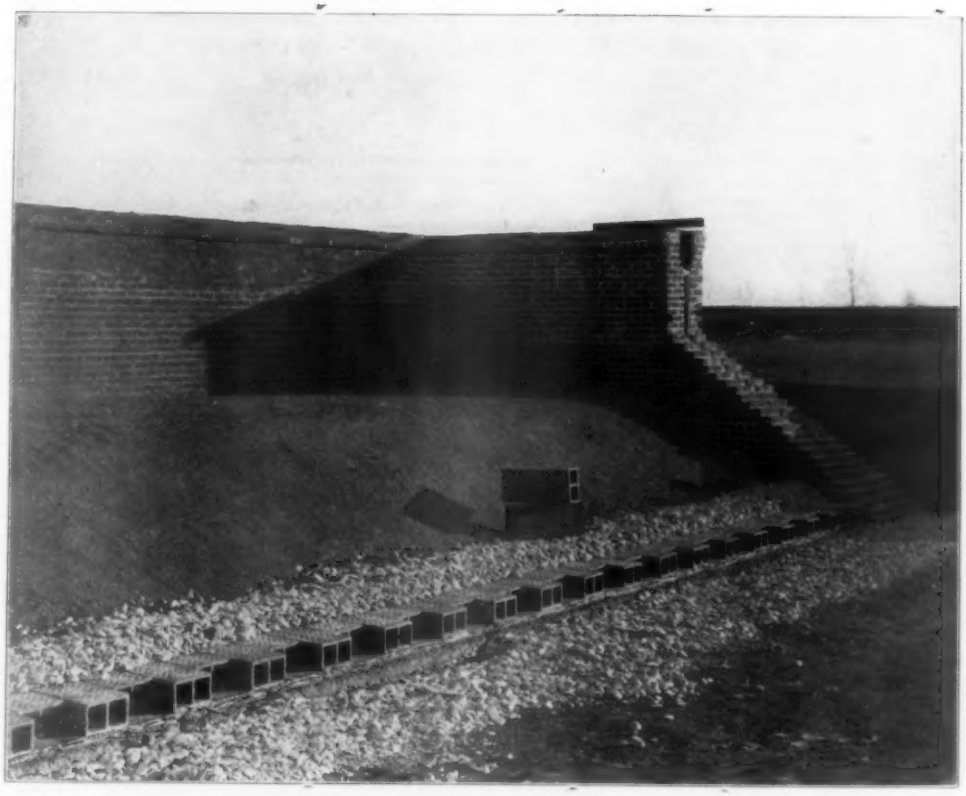

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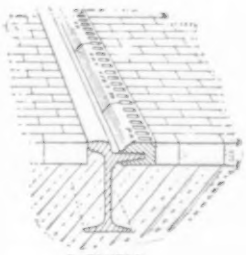

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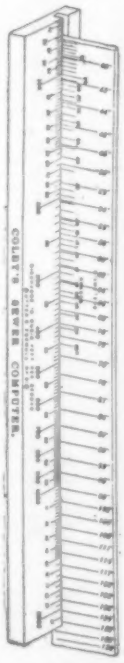

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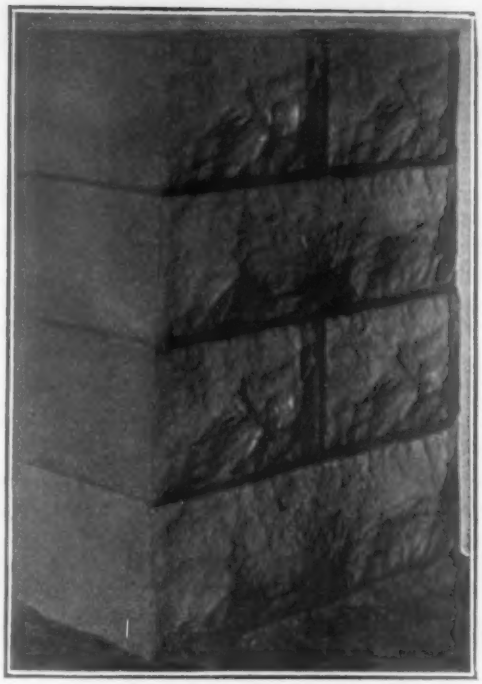

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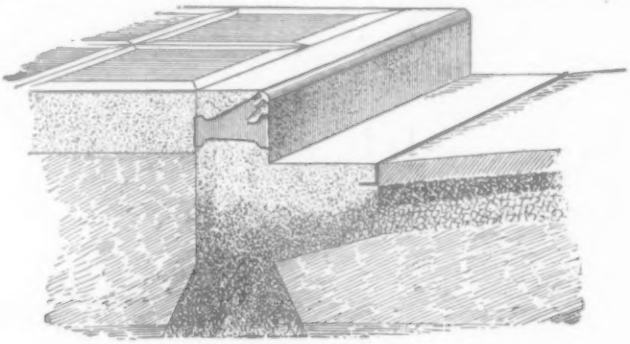

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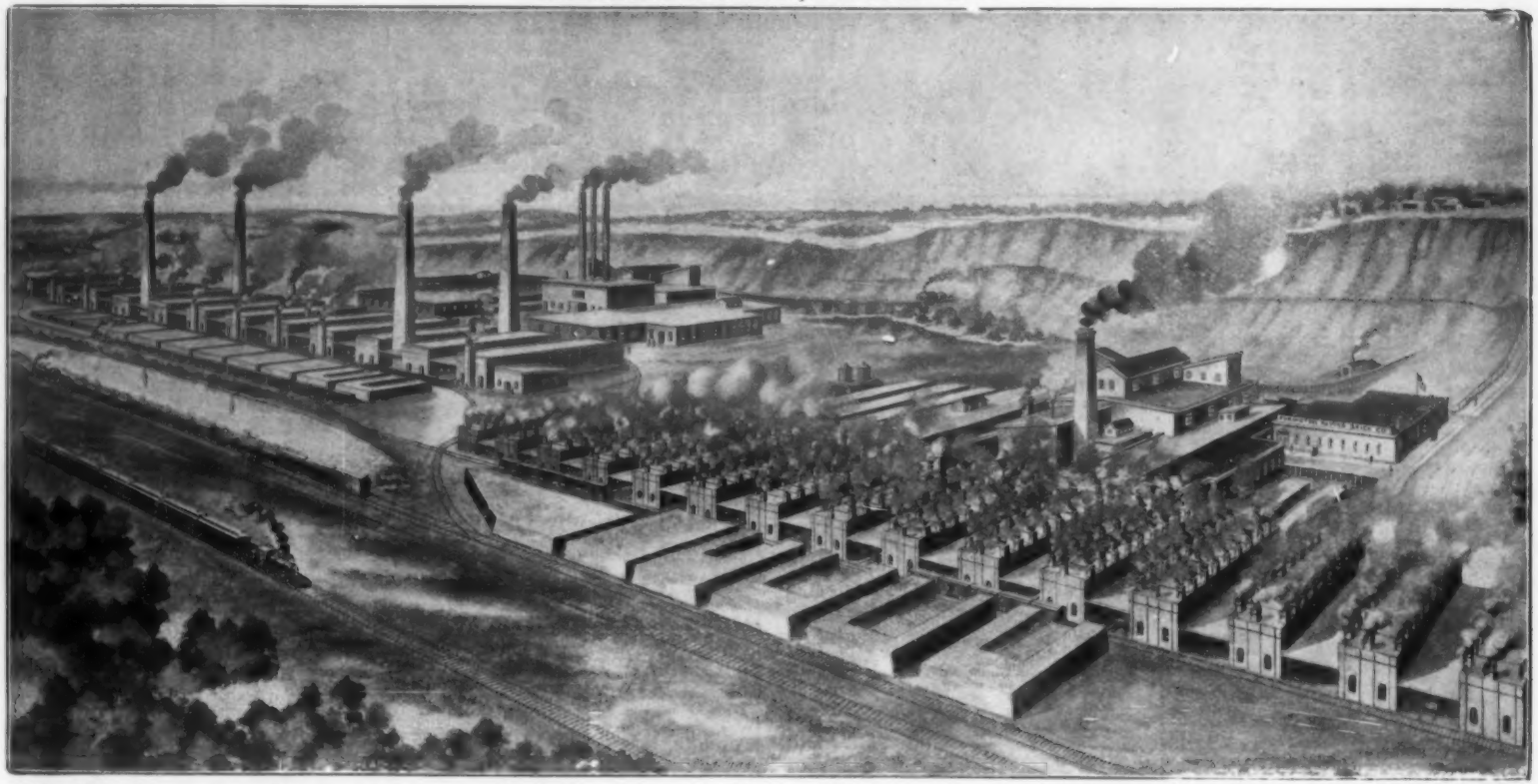

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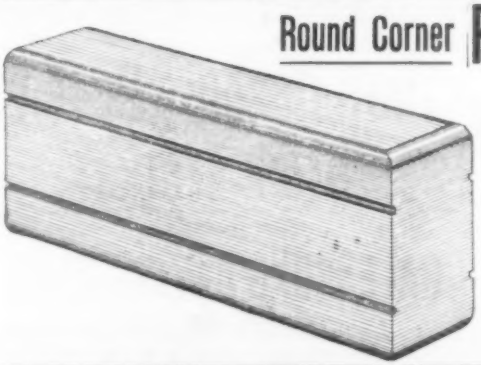

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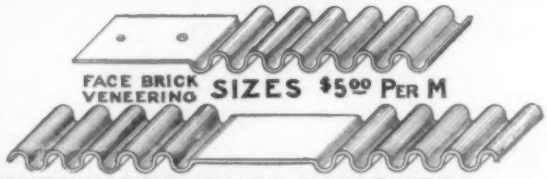

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J. W. BARNETT, City Engineer.
Athens, Georgia.

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CITY CONTRACTORS

Last winter New York City paid over $460,000 for removing snow, and then 800 teams and 3,000 men only cleaned a few streets.

Three of our machines would have done the same work better and quicker at a cost of $30,000.

The New York City contract price was 36¾ cents per cubic yard. Our machine will remove snow for 2½ cents per cubic yard. This includes interest and depreciation.

One machine will clear a six-inch snowfall from 100 miles of street, averaging fifty feet wide, in four days and nights at a cost of $2,200. A machine costs $5,000 to build. It is as long as a car, nearly as wide as half the street, and weighs 25,000 pounds.

It is a snow-melting automobile that moves about as fast as a man walks, melting the snow as it goes. It does not sweep the snow or lift it. It melts the snow just as it lays on the street and the water drains into the sewers.

The machine burns crude oil such as sells in New York for less than two cents a gallon. One machine can burn three tons of oil per hour with perfect combustion. That is the reason the snow is melted so rapidly. There was no burner that could burn oil under these severe conditions. They only wasted it. We spent $3,000 inventing a burner that would burn. Now we have a burner that burns any kind of liquid fuel with perfect combustion and that can be regulated from a candle flame to a flame thirty feet long.

So every portion of the machine has been tested and its performance not only known but guaranteed.

We did not jump at conclusions nor walk in the dark. After the inventing was over, the services of three of the best designing and consulting engineers was obtained. These men, each going over the plans independently, so believed in our success that they became stockholders in our company.

The dimension or shop drawings were made by John Edmund Bartlett, well known in America and Europe as an able engineer. He was closely associated with the famous engineers, Capt. Ericsson and Capt. Eads. During the last fourteen years he has been employed by the United States government, and he has been unusually successful with new machinery.

Others have built snow-melting machines. They will all melt snow—so will a kitchen stove. None but ours will melt six inches of snow from an average street at the rate of a mile of street per hour, and no snow melting machine ever can melt at that rapid rate without infringing our inventions.

No machine ever has or ever can (without infringing) completely clean snow from sidewalks, no matter what the width or obstructions.

No other machine can easily go ahead uninterrupted by snow piles or snow drifts.

This year the following significant changes have been made in New York City snow contracts:

(1) The contractor may use snow-melting machines.

(2) The city may use snow-melting machines independently of the contractor.

(3) The number of cubic yards is computed from the area cleaned and the depth of the snow.

The following report was made by Capt. Farrow, September 16, 1902:

DEAR SIR—I have the honor to report that a careful investigation of your snow-melting automobile convinces me of its extreme practicability and comparatively low cost of operation. The easy generation of very large quantities of heat and rapid motion of the machine insure quick drainage and prevent any accumulation of slush. The machine being self-propelled, can be regulated in its motion so as to pump a sufficiency of heated water from the street to flush the adjacent snow-covered sidewalks, regardless of their varying widths and frequent obstructions.

I estimate that with the average condition of street and weather, your snow melting automobile will remove snow at a cost of about seven or eight cents per ton of snow melted. This is assuming the cost of oil at two cents per gallon and labor at thirty cents per hour.

The simplicity of action and construction of your machine, and its easy accomplishment of practical and economical results, entitle it to the immediate consideration of Engineers and the Street Cleaning Department. Very truly yours,

EDWARD S. FARROW.

Capt. Farrow is a graduate of West Point, and later was an instructor there. He is the author of numerous scientific works. He resigned from the army to take up the profession of consulting engineer. His services are highly recommended by the Secretary of War and by Major-General Howard.

WE WANT an able and influential contractor in each of the large cities to become a member of this company and to come in with us on an equal footing.

This means an easy fortune to about ten men.

If you are the right man we ask you to write us for details.

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Civil Engineers, Surveyors, Assistants and Inspectors in the Various Branches of Municipal Engineering, Draughtsmen, Superintendents of Paving Brick Plants Foremen for Contractors,

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POSITION WANTED.—Water-Works Engineer, graduated from European school, 33 years of age, desires position either as chief or first assistant in large water-works. Familiar with every class of modern instruments and pumping machinery; expert on artesian wells and pneumatic pumping systems. Ten years' practical experience; seven years in this country. G. B. 33, care MUNICIPAL ENGINEERING Co.

A graduate civil engineer with several years' experience in municipal work wishes to locate in a city where he can do the engineering work for the city, and also secure outside engineering.

Address D., care Municipal Engineering.

CITY CIVIL ENGINEER.—Experienced. Owns transit, etc. Open for proposition. Address S. H. J., MUNICIPAL ENGINEERING.

NOTICE TO SELL ELECTRIC LIGHT PLANT.

Public notice is hereby given that bids will be received by the City Council of the City of Marshall, Illinois, at the next regular meeting of said council, which will be on November 3, 1902, for the Marshall Electric Light Plant. Bids will be received on this basis: Purchaser will be given an exclusive franchise for fifteen years and a contract to furnish the City of Marshall, Illinois, forty-three or more arc lights of the style in present use at $67.50 per light per year for ten years, moonlight schedule, and the rates for commercial lighting are to remain as now fixed. All bids must be sealed and filed with the city clerk before 12 o'clock noon of November 3, 1902, and each bidder must accompany his bid by a certified check for ten per centum of the amount of his bid. The successful bidder will be given thirty days to comply with the terms of the sale.

The City Council reserves the right to reject any or all bids.

GEORGE O. BAIRD, City Clerk.

By order of the City Council of the City of Marshall, Illinois.

STREET LIGHTING, MANKATO, MINN.

Notice is hereby given that sealed proposals will be received at the City Recorder's office, City Hall, until 3 P. M., November 7, 1902, for lighting the streets of the city of Mankato for a period of one, three or five years from December 1st, 1902, as follows, viz: First, sixty-five or more electric arc lights of 2,000 nominal candle power each; second, one hundred and eighteen or more 32-candle power each incandescent electric lights; third, the same number of gas, gasoline or oil lights, which must be at least the equivalent in candle power of the above mentioned electric lights. The lights to be located substantially as the lights in present use are located, or at such places as directed by the common council.

Bidders must state the actual candle power of their respective lamps.

Separate bids will be received for this lighting upon the Philadelphia or moonlight schedule, or the every and all night schedule. Also separate bids upon the different classes of light above specified.

Bidders will be required to furnish, set in place and maintain all apparatus required at their own cost and expense, retaining ownership of the same, and samples of the apparatus to be furnished must be exhibited, giving service, upon the streets of Mankato, as directed by the committee on city lighting, for at least one week prior to the receiving of bids.

A certified check on some solvent Mankato bank in the sum of two hundred dollars ($200) must accompany each proposal, which amount shall be forfeited to the city of Mankato as liquidated damages for failure to enter into a contract, if awarded. Check must be made payable to the city treasurer.

Bonds will be required in a sum to be fixed by council to protect the city against patent infringement suits, etc., and for faithful performance of contract.

The city reserves the right to reject any or all bids.

Mankato, Minn., October 20, 1902.

By order of the Common Council.

D. V. WILLIAMS, Recorder.

WE WANT YOU To Notice this Advertisement It will Pay You . . . . . .

We are headquarters for Supplies of every description for Contractors, such as

ENGINES AND DERRICKS, WIRE AND MANILA ROPE SCRAPERS PLOWS
BARROWS BOLTS RODS PIPE AND FITTINGS BELTING
HOSE PACKING ETC. ETC.

QUEEN CITY SUPPLY COMPANY
(PUCHTA, PUND & CO.)

201-203-205 W. PEARL STREET CINCINNATI

NOTICE TO CONTRACTORS.

Sealed bids will be received until 10 A. M. November 10, at Indianapolis, Indiana, for the following work: Grading, graveling and rolling New York street from Tacoma to Beville avenue; paving two alleys with brick; paving sidewalks on Arsenal ave., from Sixteenth to Nineteenth streets, with cement.

The Board of Public Works reserves the right to reject any or all bids.

HAROLD C. MCGREW,
EDWIN D. LOGSDON,
CHARLES MAGUIRE,
Board of Public Works.

NOTICE TO CONTRACTORS.

ALLEY CROSSING IMPROVEMENT.

Notice is hereby given that the city of Connersville will receive bids up to November 10, 1902, at 7:30 o'clock P. M. for paving the alley crossings with vitrified paving brick or block, on gravel foundation and sand cushion, with marginal stone to hold said paving brick in place. Plans and specifications for said work are on file at city clerk's office. Certified check for the sum of three hundred ($300 00) dollars to accompany each bid. Engineer's estimate approximately is 2,000 square yards.

By order of Common Council.

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No. 39 CORTLANDT STREET, NEW YORK CITY

Disposal of the Waste of Towns, Institutions, Dwellings, Hotels and Business Establishments. Power obtained from Refuse without other fuel. The Utilization of Municipal and Trade Refuse.

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Siftings for Art Stone.

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RIEGEL SACK COMPANY

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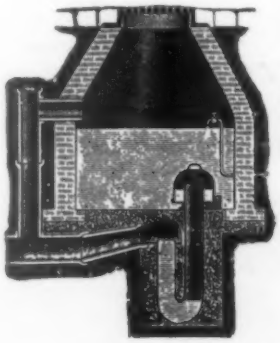

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Nothing Whatever to Get Out of Order.

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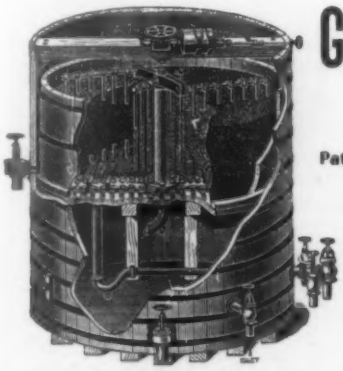

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We have a car-load—only one car-load—which we will sell, if taken at once, at a cash price which will make it an excellent bargain for any one who can use it.

The plaster is guaranteed to be of excellent quality.

Freight rates will be most favorable in territory contiguous to Buffalo, N. Y. Wire or write at once to "Calcine," care Municipal Engineering Company.

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36 inches guage 2 locomotive, 12½-ton saddle tank style.
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56½ inches gauge 1 locomotive, four driving wheels, 20 tons weight with 8 wheel tender.

They are all new machines, just completed, ready for immediate delivery. For detailed description and prices (bona fide intending users only),

Address H. K. PORTER COMPANY, Builders of Steam and Compressed Air Locomotives, 536 Wood St., Pittsburg, Pa.

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PATENTS: The process of septic treatment in open or closed tanks. Fittings and apparatus for same. Automatic alternating gear for filters.

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If you want prices or information on anything, write to us and we will promptly put you in the way of getting it without charge.

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Salary Increased $70 a Month.

I believe your Course unequaled, for while having substantially prospered as a result of study so far, I have devoted only a small portion of my time toward its completion. I had previously been surveyor for Jersey Co., Ill., a position of little remuneration, sometimes bringing me less than $200 a year. Now, as a result of my I. C. S. training, I receive $125 a month and am doing engineering work. A. W. NEWTON,
Engineer, Board of Sny Island Levee Drainage, Pittsfield, Ill.

You owe it to yourself to find out just what we can do for YOU. Fill out and send in the coupon TODAY!

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Please explain how I can qualify for position marked X below.

	Civil Engineer		Contractor and Builder
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	Railroad Engineer		Marine Engineer
	Surveyor		Sign Painter
	Electrician		Chemist
	Electrical Engineer		Sheet-Metal Draftsman
	Architect		Bookkeeper
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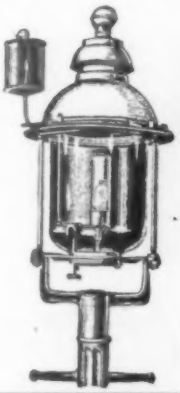

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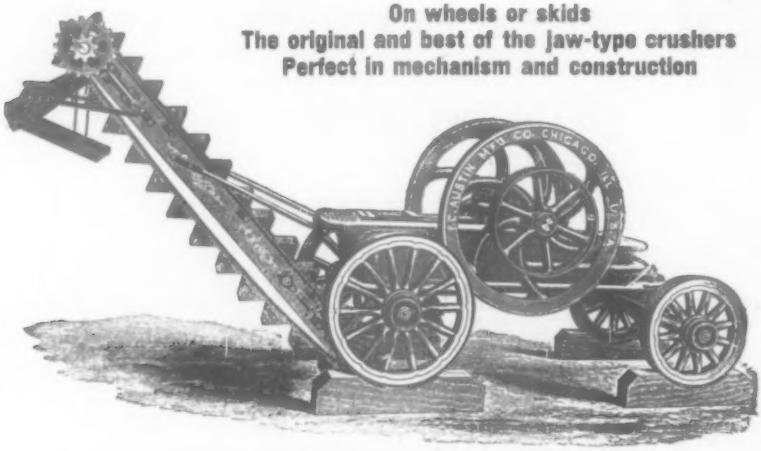

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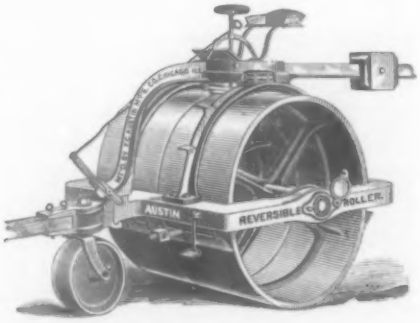

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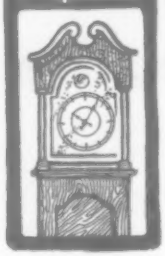

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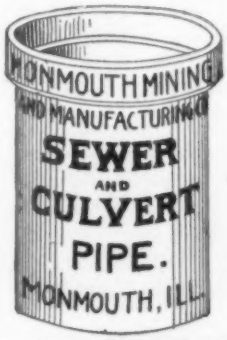

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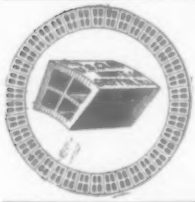

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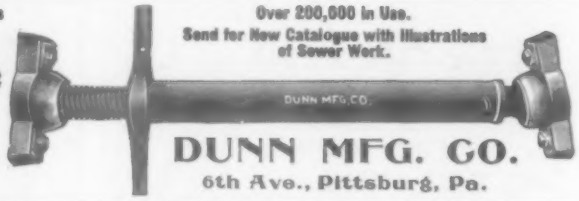

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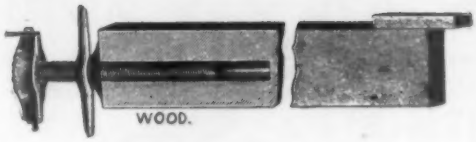

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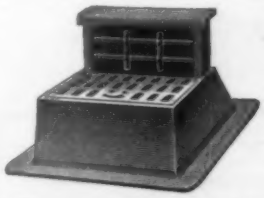

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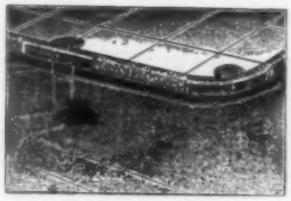

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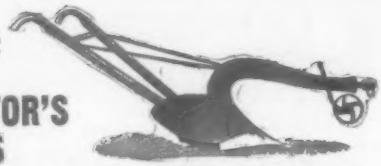

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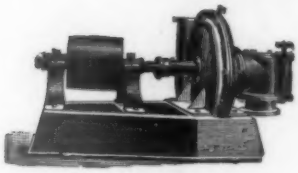

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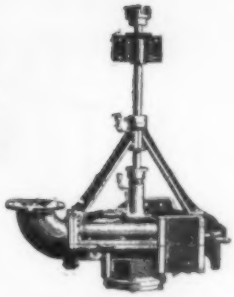

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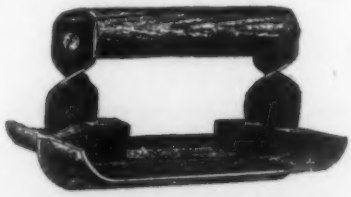

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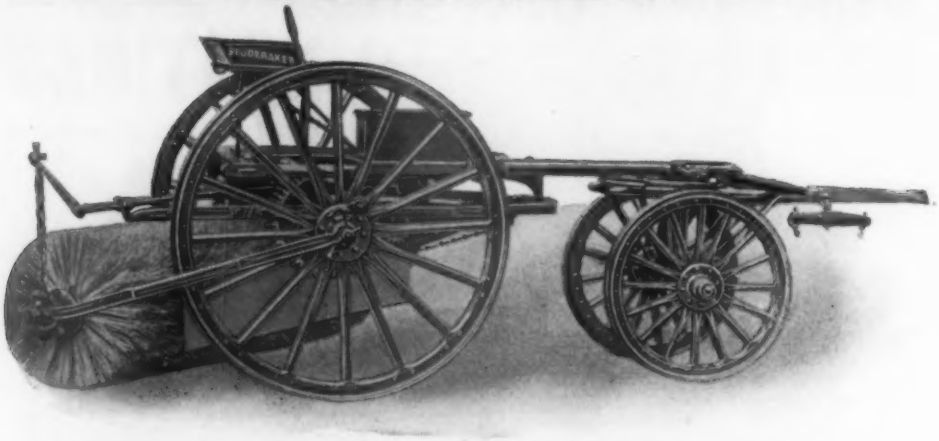

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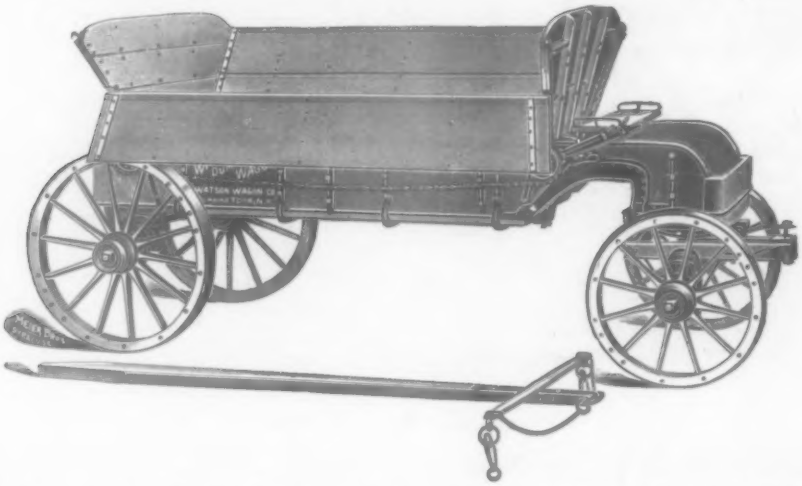

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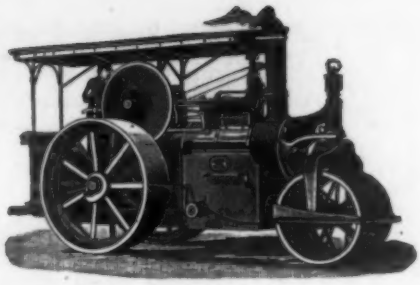

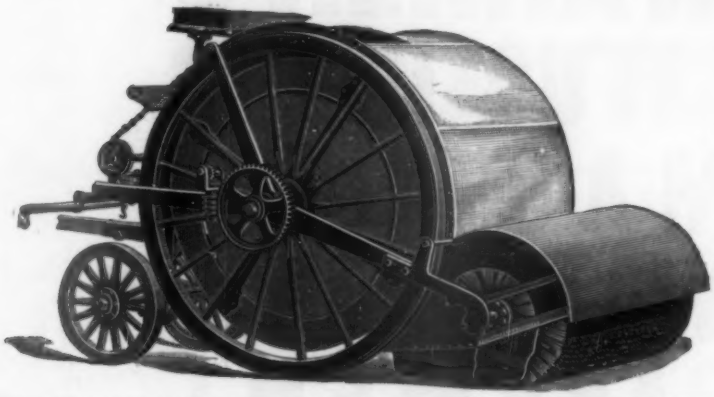

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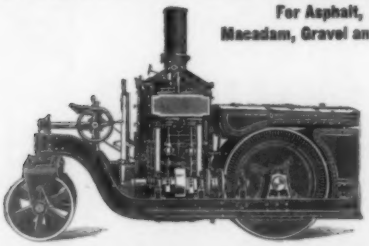

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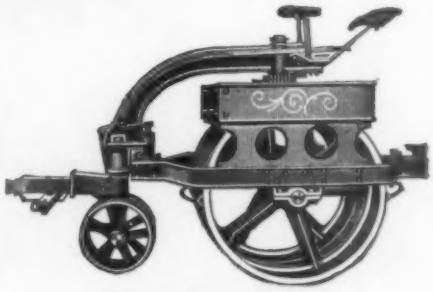

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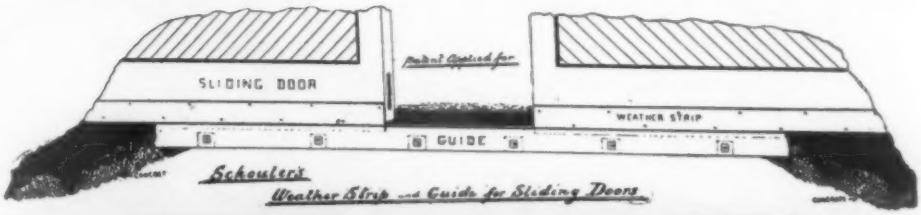

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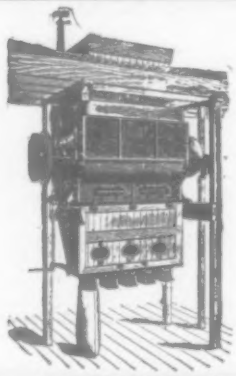

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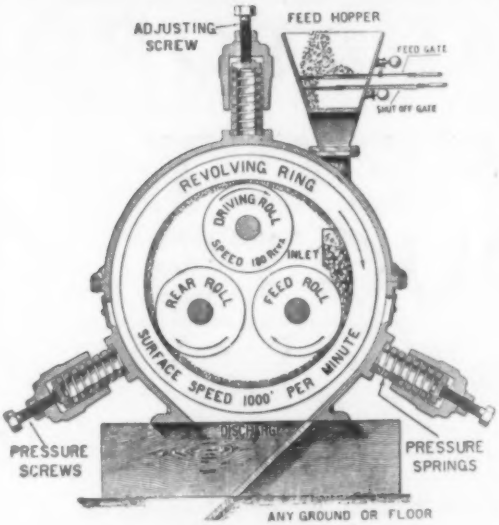

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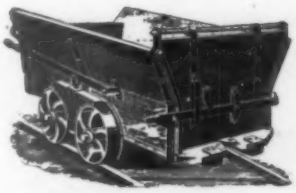

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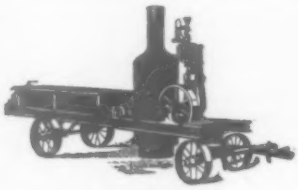

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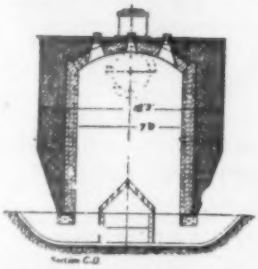

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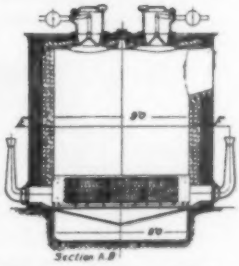

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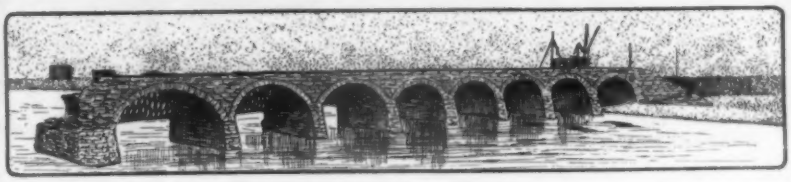

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H. & A. B. Aveline Sicilian Rock Asphalt Co., Catania, Italy (postage 5 cents).
The Barber Asphalt Paving Co., New York City.
T. Hugh Boorman, New York, N. Y.
Densmore Stabler Refining Co., Los Angeles, Cal.
Joseph J. Duffy & Co., Chicago, Ill.
Gabriel & Schall, New York City.
Globe Asphalt Co., Pittsburg, Pa.
Green River Asphalt Co., St. Louis, Mo.
Otto E. C. Guelich, Detroit, Mich.
Hercules Oil Refining Co., Los Angeles, Cal.
Jewett & Blodgett Oil Co., Bakersfield, Cal.
Charles W. Saacke, New York City.
The Sicilian Asphalt Paving Co., New York.
Southern Refining Co., Los Angeles, Cal.
Union Oil Co., San Francisco, Cal.
Uvalde Asphalt Co., New York City.
Warren Asphalt Paving Co., Utica, N. Y.
Western Paving and Supply Co., Indianapolis, Ind.

Asphalt (Brunswick) Importers.
Gabriel & Schall, New York City.

Asphalt Blocks.
Lake Erie Asphalt Block Co., Toledo, O.
New Castle Asphalt Block Co., Pittsburg, Pa.

Asphalt Machinery.
Drake Standard Machine Works, Chicago, Ill.
Iroquois Iron Works, Buffalo, N. Y.
Robert Hooke, Chattanooga, Tenn.
Julian Scholl & Co., New York City.

Asphalt Mixers.
Erie Machine Shop, Erie, Pa.
Iroquois Iron Works, Buffalo, N. Y.

Asphalt Pavements.
Ayers Asphalt Paving Co., Zanesville, O.
Barber Asphalt Paving Co., New York.
R. F. Conway Co., Chicago, Ill.
Thomas L. Dooley, Chicago, Ill.
Joseph J. Duffy & Co., Chicago, Ill.
J. U. Fritchey, Lancaster, Pa.
Gilsonite Construction Co., St. Louis, Mo.
Green River Asphalt Co., St. Louis, Mo.
Otto E. C. Guelich, Detroit, Mich.
F. H. Kirchner & Co., Cincinnati, O.
Wm. Krause & Son, Philadelphia, Pa.
John Lipps, Cincinnati, O.
Nelson Paving Co., Waco, Tex.
New Castle Asphalt Block Co., Pittsburg, Pa.
Charles W. Saacke, New York, N. Y.
Schillinger Bros. Co., Toledo, O.
The Sicilian Asphalt Paving Co., New York.
Warren Asphalt Paving Co., Utica, N. Y.
Warren Bros. Co., Boston, Mass.
Western Construction Co., Lafayette, Ind.

Asphalt Plants.
Erie Machine Shop, Erie, Pa.
Iroquois Iron Works, Buffalo, N. Y.

Asphalt Railroad Plants.
Iroquois Iron Works, Buffalo, N. Y.

Asphalt Repair Plant.
Robert Hooke, Chattanooga, Tenn.

Asphalt Sidewalks.
Warren Bros. Co., Boston, Mass.

Asphalt Tanks.
W. B. Scaife & Sons, Pittsburg, Pa.

Asphalt Tools.
W. H. Anderson & Sons, Detroit, Mich.
Contractors' Tool Company, Philadelphia, Pa.
F. H. Crafts, Rochester, N. Y.
Iroquois Iron Works, Buffalo, N. Y.
Orr & Lockett Hardware Co., Chicago, Ill.
Julian Scholl & Co., New York City.

Belting.
Queen City Supply Co., Cincinnati, O.

Bitulithic Pavements.
The Central Bitulithic Paving Co., Zanesville, O.
Hoosier Construction Co., Indianapolis, Ind.
Warren Bituminous Paving Co. of Ontario, Toronto, Can.
Warren Bros. Co., Boston, Mass.
Warren Bros. Co., Philadelphia, Pa.

Bituminous Macadam.
The Central Bitulithic Paving Co., Zanesville, O.
Hoosier Construction Co., Indianapolis, Ind.
Warren Bituminous Paving Co. of Ontario, Toronto, Can.
Warren Bros. Co., Boston, Mass.
Warren Bros. Co., Philadelphia, Pa.

Blue Print Paper.
The H. Cole Co., Columbus, O.

Boilers.
Marinette Iron Works, Marinette, Wis.
W. B. Scaife & Sons, Pittsburg, Pa.

Bolting Screens.
Jeffrey Mfg. Co., Columbus, O.

Bridges.
Anderson Bridge & Scraper Co., Anderson, Ind.
The Bedford Quarries Co., Chicago, Ill.
Concrete Steel Engineering Co., New York City.
Wm. Fife & Son, Indianapolis, Ind.
General Supply & Construction Co., New York City.
Hollensbe Stone Co., Westport, Ind.
Wm. B. Scaife & Sons Co., Pittsburg, Pa.

Cars.
Cleveland Car Co., Cleveland, O.
Niles Mine & Mill Supply Co., Cleveland, O.

Castings.
Hennessy Foundry Company, Springfield, O.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.

Catch Basin Manufacturers.
Byram Foundry Co., Indianapolis, Ind.
Kramer Bros., Dayton, O.

Cement.
Alpha Portland Cement Co., Alpha, N. J.
Alsen's Portland Cement Works, New York.
Atlas Portland Cement Co., New York City.
F. Behrend, New York City.
Brier Hill Coal & Iron Co., Youngstown, O.
Buckeye Portland Cement Co., Bellefontaine, O.
Cayuga Lake Cement Co., Ithaca, N. Y.
Commercial Wood and Cement Co., Philadelphia.
H. J. Conkling, Cincinnati, O.
Detroit Portland Cement Co., Detroit, Mich
Ellis-Blum Co., Meadville, Pa.
Empire Portland Cement Co., Warner, N. Y.
Gabriel & Schall, New York City.
General Supply & Construction Co., New York City.
Glens Falls Portland Cement Co., Glens Falls, N. Y.
W. G. Hartranft Cement Company, Philadelphia, Pa.
Illinois Steel Co., Chicago, Ill.
Kelley Island Lime and Transport Co., Cleveland, O.
D. J. Kennedy, Pittsburg, Pa.
Lawrence Cement Co., New York City.
Lehigh Portland Cement Co., Allentown, Pa.
Lesley & Trinkle, Philadelphia, Pa.
Meacham & Wright, Chicago, Ill.
Michigan Alkali Company, Wyandotte, Mich.
Milwaukee Cement Co., Milwaukee, Wis.
New Jersey Portland Cement Co., Perth Amboy N. J.
Omega Portland Cement Co., Jonesville, Mich.
Peninsular Portland Cement Co., Jackson, Mich.
St. Louis Portland Cement Co., St. Louis, Mo.
T. W. Spinks, Covington, Ky.
Schaeffer & Gengnagel, Dayton, O.

Wabash Portland Cement Co., Detroit, Mich.
Charles Warner & Co., New York.
I. L. Van Natta & Co., Lafayette, Ind.

Cement Construction.
W. W. Benson, Terre Haute, Ind.
H. S. Palmer Concrete Building Block Co., Washington, D. C.
Noyes F. Palmer, Brooklyn, N. Y.
Standard Stone Co., Wilmington, Del.
Stevens Cast Stone Co., Chicago, Ill.

Cement Machinery.
C. O. Bartlett & Co., Cleveland, O.
The Bonnot Co., Canton, O.
Chambers Bros. Co., Philadelphia, Pa.
Cleveland Car Co., Cleveland, O.
Dodge Manufacturing Company, Mishawaka, Ind.
Duff Patents Co., Pittsburg, Pa.
W. D. Dunning, Syracuse, N. Y.
S. Howes Co., Silver Creek, N. Y.
Jeffrey Mfg. Co., Columbus, O.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.
Kent Mill Co., New York.
Raymond Bros. Impact Pulverizer Co., Chicago, Ill.

Cement Packers.
S. Howes Co., Silver Creek, N. Y.

Cement Pans.
W. B. Scaife & Sons Co., Pittsburg, Pa.

Cement Paving.
H. A. Allen, Streator, Ill.
American Art Tile Co., Columbus, Ohio.
H. G. Coldwell, Indianapolis, Ind.
Thos. L. Dooley, Chicago, Ill.
Gilsonite Construction Co., St. Louis, Mo.
Noyes F. Palmer, Brooklyn, N. Y.
Ohio Stone and Paving Company, Youngstown, O.
L. F. Perdue, Terre Haute, Ind.
Rogers & Dunlop, Indianapolis, Ind.
M. C. Russell Cement Paving Co., Springfield, O.
W. H. Settle & Co., Cincinnati, O.
G. B. Wright, Geneva, Ohio.

Cement Plant Designers.
Booth, Garrett & Blair, Philadelphia, Pa.
Lathbury & Spackman, Philadelphia, Pa.
Watson Vredenburgh, Jr., New York city.

Cement Tools.
W. H. Anderson & Sons, Detroit, Mich.
Contractors' Tool Co., Philadelphia, Pa.
F. H. Crafts, Rochester, N. Y.
Orr & Lockett Hardware Co., Chicago, Ill.

Centrifugal Pumps.
Irvin Van Wie, Syracuse, N. Y.

Chemical Tests.
Booth, Garrett & Blair, Philadelphia, Pa.
Lathbury & Spackman, Philadelphia, Pa.
Pittsburg Testing Laboratory, Pittsburg, Pa.

Civil Engineers.
Chester E. Albright, Philadelphia, Pa.
Stephen E. Babcock, Utica, N. Y.
C. C. Brown, Indianapolis, Ind.
Mason L. Brown, Detroit, Mich.
W. H. Bryan, St. Louis, Mo.
F. W. Cappelen, Minneapolis, Minn.
B. H. Colby, St. Louis, Mo.
John A. Cole & Son, Chicago, Ill.
Downey & Wilcox, Anderson, Ind.
Engineering Co. of America, New York City.
Wm. H. Evers Engineering Co., Cleveland, O.
William B. Ewing, La Grange, Ill.
John P. Force, Columbus, O.
Howard Egleston, Havana, Cuba.
General Supply & Construction Co., New York City.
Gordon Engineering & Construction Co., Cincinnati, O.
C. G. H. Goss, Martinsville, Ind.
John J. Hainsworth, Indianapolis, Ind.
Hering & Fuller, New York, N. Y.
Iowa Engineering Co., Clinton, Iowa.
Jeup, Moore & Minor, Indianapolis, Ind.
John Lorenz, Hamilton, Ohio.
M. W. Kingsley, Cleveland, O.
Chester R. McFarland, Cleveland, O.
Dabney H. Maury, Peoria, Ill.
The Municipal Engineering Co. (Inc.), New York City.
George S. Pierson, Kalamazoo, Mich.
Ohio Engineering Company, Elyria, O.
Clement L. Reamer, Newark, O.
Walter P. Rice Engineering Co., Cleveland, O.
W. S. Shields, Chicago, Ill.
Snow & Barbour, Columbus, O.
J. B. Stuart, Pittsburg, Pa.
R. H. Tingley, Providence, R.
Walter R. Toy, Lima, O.
M. Tschirgi, Jr., Dubuque, Iowa.
Watson Vredenburgh, Jr., New York city.
Wardle & Yeager, Cedar Rapids, Iowa.
Waring, Chapman & Farquhar, New York, N. Y.
Wise & Watson, Passaic, N. J.
Frank W. Wood, Chicago, Ill.

Clay-Working Machinery.
The Bonnot Co., Canton, O.
Chambers Bros. Co., Philadelphia, Pa.
Cleveland Car Co., Cleveland, O.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.
Raymond Bros. Impact Pulverizer Co., Chicago, Ill.

Clay Products.
American Clay Mfg. Co. of N. J., Pittsburg, Pa.
H. J. Conkling, Cincinnati, O.
Georgia Vitrified Brick and Clay Co., Augusta, Ga.
Reese-Hammond Fire Brick Co., Bolivar, Pa.

Coal and Coke.
Schaeffer & Gengnagel, Dayton, O.

Coal Tar.
E. B. Warren & Co., Washington, D. C.
Warren Bros. Co., Boston, Mass.
Warren Bros. Co., Philadelphia, Pa.

Combined Curb and Gutter.
D. C. Buntin, Indianapolis, Ind.
H. A. Lensing, Evansville, Ind.
Harry C. McKay, Cincinnati, O.
L. F. Perdue, Terre Haute, Ind.
M. C. Russell Cement Paving Co., Springfield, O.
W. H. Settle & Co., Cincinnati, O.
Warren Bros. Co., Boston, Mass.
G. B. Wright, Geneva, Ohio.

Concrete Blocks.
Noyes F. Palmer, Brooklyn, N. Y.

Concrete Mixers.
Chambers Bros Co., Philadelphia, Pa.
Contractors Plant Co., Boston, Mass.
Drake Standard Machine Works, Chicago, Ill.
W. D. Dunning, Syracuse, N. Y.
Jeffrey Mfg. Co., Columbus, O.
Julian Scholl & Co., New York City.

Concrete Steel Arch Bridges.
Concrete Steel Engineering Co., New York City.

Concrete Work.
James W. Ball, Wyncote, Pa.
W. W. Benson, Terre Haute, Ind.
S. W. Coombs & Son, Cedar Falls, Ia.
Thos. L. Dooley, Chicago, Ill.
J. G. Hutchinson, Hamilton, O.
H. A. Lensing, Evansville, Ind.
John A. McGarry & Co., Chicago, Ills.
Noyes F. Palmer, Brooklyn, N. Y.
Standard Stone Co., Wilmington, Del.
Stevens Cast Stone Co., Chicago, Ill.
Warren Bros. Co., Boston, Mass.

Contractors.
H. A. Allen, Streator, Ill.
American Art Tile Co., Columbus, Ohio.
James W. Ball, Wyncote, Pa.
Thos. Bridges' Sons, Wabash, Ind.
D. C. Buntin, Indianapolis, Ind.
The Central Bitulithic Paving Co., Zanesville, O.
City Wastes Disposal Co., New York City.
Cleveland Silex Stone Co., Detroit, Mich.
R. F. Conway Co., Chicago, Ill.
Thos. L. Dooley, Chicago, Ill.
Joseph J. Duffy & Co., Chicago, Ill.
Wm. Fife & Son, Indianapolis, Ind.
Fielding & Shepley, St. Paul, Minn.
General Supply & Construction Co., New York City.
Otto E. C. Guelich, Detroit, Mich.
J. U. Fritchey, Lancaster, Pa.
Gilsonite Construction Co., St. Louis, Mo.
Gordon Engineering and Construction Co., Cincinnati, O.
J. H. Green & Son, Appleton, Wis.

Hoosier Construction Co., Indianapolis, Ind.
J. G. Hutchinson, Hamilton, O.
Wm. Krause & Son, Philadelphia, Pa.
F. H. Kirchner & Co., Cincinnati, Ohio.
H. A. Lensing, Evansville, Ind.
John Lipps, Cincinnati, O.
John A. McGarry & Co., Chicago, Ill.
Harry C. McKay, Cincinnati, O.
J. H. Marden Cement Paving Co., La Crosse, Wis.
Nashville Roofing & Paving Co., Nashville, Tenn.
Nelson Paving Co., Waco, Tex.
L. F. Perdue, Terre Haute, Ind.
A. G. Pugh, Columbus, O.
Rogers & Dunlop, Indianapolis, Ind.
M. C. Russell Cement Paving Co., Springfield, O.
Schillinger Bros. Co., Toledo, O.
B. M. & J. F. Shanley, Philadelphia, Pa.
W. H. Settle & Co., Cincinnati, O.
Smith, Moss & Brown, Chicago, Ill.
Standard Paving Co., Newark, N. J.
Troy Public Works Co., Utica, N. Y.
Chas. H. Warford & Co., Dayton, O.
Wright & Childers, Grammer, Ind.
G. B. Wright, Geneva, Ohio.

Contractors and Builders.
J. G. Hutchinson, Hamilton, O.

Contractors' Supplies.
E. T. Adams, Detroit, Mich.
Cleveland Car Co., Cleveland, Ohio.
H. J. Conkling, Cincinnati, O.
Ellis-Blum Co., Meadville, Pa.
General Supply & Construction Co., New York City.
Queen City Supply Co., Cincinnati, O.
Schaeffer & Gengnagel, Dayton, O.
Chas. H. Warford & Co., Dayton, O.
E. B. Warren & Co., Washington, D. C.

Contractors' Wagons.
Studebaker Bros. Mfg. Co., South Bend, Ind.
D. S. Watson, Canastota, N. Y.

Contractors' Tools and Machinery.
W. H. Anderson & Sons, Detroit, Mich.
Austin & Western Co., Ltd., Chicago, Ill.
Contractors' Plant Co., Boston, Mass.
F. H. Crafts, Rochester, N. Y.
Queen City Supply Co., Cincinnati, O.
Contractors' Tool Company, Philadelphia, Pa.
Orr & Lockett Hardware Co., Chicago, Ill.
Julian Scholl & Co., New York City.
Syracuse Chilled Plow Co., Syracuse, N. Y.

Conveyors.
C. O. Bartlett & Co., Cleveland, O.
Carson Trench Machine Co., Boston, Mass.
Dodge Manufacturing Company, Mishawaka, Ind.
The Jeffrey Mfg. Co., Columbus, O.
Niles Mine and Mill Supply Co., Niles, O.
Syracuse Chilled Plow Company, Syracuse, N. Y.

Corrugated Iron and Steel.
Niles Mine & Mill Supply Co., Cleveland, O.
W. B. Scaife & Sons Co., Pittsburg, Pa.

Creosoted Wood Block.
Hoosier Construction Co., Indianapolis, Ind.
Republic Chemical and Creosoting Co., Indianapolis, Ind.
Terre Haute Creosoting Co., Terre Haute, Ind.

Crushers, Rock and Ore.
Austin & Western Co., Ltd., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
Julian Scholl & Co., New York City.
Kent Mill Co., New York.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.

Crushed Stone.
The Bedford Quarries Co., Chicago, Ill.
Thos. Bridges' Sons, Wabash, Ind.
Cleveland Stone Co., Chicago, Ill.

Culvert Pipe, Vitrified.
American Clay Mfg. Co. of N. J., Pittsburg, Pa.
Buckeye Fire Clay Co., Uhrichsville, O.
H. J. Conkling, Cincinnati, O.
Evens & Howard, St. Louis, Mo.
Mecca Clay Works, Mecca, Parke Co., Ind.
Michigan Sewer Pipe Co., Jackson, Mich.
Monmouth Mining and Mfg. Co., Monmouth, Ill.
Royal Sewer Pipe & Fire Brick Co., Akron, O.
H. Stevens' Sons Co., Macon, Ga.
U. S. Clay Mfg. Co., Griffin, Ill.
Thos. L. Dooley, Chicago, Ill.

Curbing.
H. A. Allen, Streator, Ill.
James W. Ball, Wyncote, Pa.
D. C. Buntin, Indianapolis, Ind.
Cleveland Stone Company, Cleveland, O.
Hollensbe Stone Co., Westport, Ind.
H. A. Lensing, Evansville, Ind.
Harry C. McKay, Cincinnati, O.
Ohio Stone and Paving Co., Youngstown, O.
L. F. Perdue, Terre Haute, Ind.
Rogers & Dunlop, Indianapolis, Ind.
W. H. Settle & Co., Cincinnati, O.
Warren Bros. Co., Boston, Mass.
G. B. Wright, Geneva, Ohio.

Derricks.
Queen City Supply Co., Cincinnati, O.

Drain Tile.
H. J. Conkling, Cincinnati, O.
D. J. Kennedy, Pittsburg, Pa.
Michigan Sewer Pipe Co., Jackson, Mich.
Royal Sewer Pipe & Fire Brick Co., Akron, O.

Dryers.
Cleveland Car Co., Cleveland, O.
Iroquois Iron Works, Buffalo, N. Y.

Dump Cars.
Cleveland Car Co., Cleveland, O.
Niles Mine & Mill Supply Co., Cleveland, O.

Dump Wagons.
Studebaker Bros. Mfg. Co., South Bend, Ind.
United States Sanitary Co., Washington, D. C.
Watson Wagon Co., Canastota, N. Y.

Electrical Supplies.
W. Grant Thorpe, Newburgh, N. Y.

Electrolytic Investigations.
Dabney H. Maury, Peoria, Ill.

Engines, Portable and Stationary.
Marinette Iron Works, Marinette, Wis.
Queen City Supply Co., Cincinnati, O.

Filtration Plants.
New York Continental Jewell Filtration Co., New York City.
Wm. B. Scaife & Sons Co., Pittsburg, Pa.

Feed Water Plants.
New York Continental Jewell Filtration Co., New York City.
Wm. B. Scaife & Sons Co., Pittsburg, Pa.

Fire Alarm Telegraph.
Gamewell Fire Alarm Telegraph Co., New York.

Fire Brick.
American Clay Mfg. Co. of N. J., Pittsburg, Pa.
Clearfield Clay Working Co., Clearfield, Pa.
H. J. Conkling, Cincinnati, O.
Evens & Howard, St. Louis, Mo.
Kentucky Fire Brick Co., Portsmouth, O.
Michigan Sewer Pipe Co., Jackson, Mich.
Reese-Hammond Fire Brick Co., Bolivar, Pa.
Royal Sewer Pipe & Fire Brick Co., Akron, O.
H. Stevens' Sons Co., Macon, Ga.
St. Louis Vitrified & Fire Brick Co., St. Louis, Mo.

Fire Clay Products.
American Clay Mfg. Co. of N. J., Pittsburg, Pa.
Buckeye Fire Clay Co., Uhrichsville, O.
Clearfield Clay Working Co., Clearfield, Pa.
H. J. Conkling, Cincinnati, O.
Evens & Howard, St. Louis, Mo.
Kentucky Fire Brick Co., Portsmouth, O.
Mecca Clay Works, Mecca, Parke Co., Ind.
Michigan Sewer Pipe Co., Jackson, Mich.
Monmouth Mining and Mfg. Co., Monmouth, Ill.
Reese-Hammond Fire Brick Co., Bolivar, Pa.
The Royal Sewer Pipe & Fire Brick Co., Akron, O.
H. Stevens' Sons Co., Macon, Ga.
St. Louis Vitrified & Fire Brick Co., St. Louis, Mo
J. L. Van Natta & Co., Lafayette, Ind.

Fire Wagons.
Robert Hooke, Chattanooga, Tenn.

Flagging.
The Bedford Quarries Co., Chicago, Ill.
Cleveland Stone Co., Cleveland, O.
Hollensbe Stone Co., Westport, Ind.

Flint Pebbles.
John D. McGlincey, New York, N. Y.

BUSINESS DIRECTORY—CONTINUED.

Flue Liners.
American Clay Mfg. Co. of N. J., Pittsburg, Pa.
H. J. Conkling, Cincinnati, O.
Royal Sewer Pipe & Fire Brick Co., Akron, O.

Flush Tanks.
Pacific Flush Tank Co., Chicago, Ill.

Garbage Carts.
United States Sanitary Co., Washington, D. C.

Garbage Disposal Plants.
City Wastes Disposal Co., New York City.
The Municipal Engineering Co. (Inc.), New York City.

Gas Engines.
August Mietz, New York City.
Marinette Iron Works Mfg. Co., Marinette, Wis.

Gas Producer Plants.
Duff Patents Co., Pittsburg, Pa.

Hoisters.
W. H. Anderson & Sons, Detroit, Mich.
C. O. Bartlett & Co., Cleveland, O.
Carson Trench Machine Co., Boston, Mass.
Potter Mfg. Co., Indianapolis, Ind.

Hollow Block Machinery.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.

Hydraulic Cement.
H. J. Conkling, Cincinnati, O.
Meacham & Wright, Chicago, Ill.
Milwaukee Cement Co., Milwaukee, Wis.

Hydraulic Rams.
Power Specialty Co., New York.

Incandescent Lamps.
W. Grant Thorpe, Newburgh, N. Y.

Iron Paving Block.
American Street Railway Paving & Improvement Co., Springfield, Mass.

Kerosene Engines.
August Mietz, New York City.

Lamps, Gas and Gasoline.
Brilliant Gas Lamp Co., Chicago, Ill.
Reserve Foundry & Mfg. Co., Cleveland, O.

Landscape Engineers.
Mason L. Brown, Detroit, Mich.

Lawn Mowers.
Clipper Lawn Mower Co., Norristown, Pa.

Lime.
H. J. Conkling, Cincinnati, O.
A. H. Lauman, Pittsburg, Pa.

Macadam and Concrete Stone.
B. M. & J. F. Shanley, Philadelphia, Pa.

Macadamizing.
James W. Ball, Wyncote, Pa.
Troy Public Works Co., Utica, N. Y.
Warren Bros. Co., Boston, Mass.
Wright & Childers, Grammer, Ind.

Marbleithic Flooring.
The Marbleithic Co., Dayton, O.

Mechanical Engineers.
W. H. Bryan, St. Louis, Mo.
Dabney H. Maury, Peoria, Ill.

Municipal Lighting.
Abner Acetylene Gas Co., Chicago, Ill.
Brilliant Gas Lamp Co., Chicago, Ill.
John Lorenz, Hamilton, Ohio.
Reserve Foundry & Mfg. Co., Cleveland, O.

Packing.
Joseph Allen, Collingswood, N. J.

Paving Blocks.
Clinton Paving and Building Brick Company, Clinton, Ind.
Kentucky Fire Brick Co., Portsmouth, O.
McAvoy Vitrified Brick Co., Philadelphia, Pa.
Metropolitan Paving Brick Co., Canton, O.
Purington Paving Brick Co., Galesburg, Ill.
Roseville Brick and Terra Cotta Co., Roseville, O.
Saginaw Clay Mfg. Co., Saginaw, E. S., Mich.
Springfield Paving Brick Co., Springfield, Ill.

Paving Brick.
American Clay Mfg. Co. of N. J., Pittsburg, Pa.
Clearfield Clay Working Co., Clearfield, Pa.
Clinton Paving and Building Brick Co., Clinton, Ind.
Colinwood Shale Brick Co., Colinwood, Ohio.
W. S. Dickey Clay Mfg. Co., Kansas City, Mo.
Galesburg Paving Brick Company, Galesburg, Ill.
Georgia Vitrified Brick and Clay Co., Augusta, Ga.
Kentucky Fire Brick Co., Portsmouth, O.
McAvoy Vitrified Brick Co., Philadelphia, Pa.
Metropolitan Paving Brick Co., Canton, O.
Moore, E. H., Chicago, Ill.
Purington Paving Brick Co., Galesburg, Ill.
Reese-Hammond Fire Brick Co., Bolivar, Pa.
Roseville Brick and Terra Cotta Co., Roseville, O.
Saginaw Clay Mfg. Co., Saginaw, E. S., Mich.
Sangamo Brick Company, Springfield, Ill.
Scranton Vitrified Brick and Tile Company, Scranton, Pa.
Springfield Paving Brick Co., Springfield, Ill.
St. Louis Vitrified & Fire Brick Co., St. Louis, Mo.
Wabash Clay Mfg. Co., Veedersburg, Ind.

Paving Brick Machinery.
Chambers Bros. Co., Philadelphia, Pa.
Cleveland Car Co., Cleveland, Ohio.
Henry Martin Brick Machine Mfg. Co. (Inc.), Lancaster, Pa.

Paving, Cement Sidewalk.
H. A. Allen, Streator, Ill.
H. G. Coldwell, Indianapolis, Ind.
S. W. Coombs & Son, Cedar Falls, Ia.
Thos. L. Dooley, Chicago, Ill.
Ohio Stone & Paving Co., Youngstown, O.
Rogers & Dunlop, Indianapolis, Ind.
G. B. Wright, Geneva, Ohio.

Paving Contractors.
H. A. Allen, Streator, Ill.
James W. Ball, Wyncote, Pa.
The Central Bitulithic Paving Co., Zanesville, O.
Cleveland Silex Stone Co., Detroit, Mich.
H. G. Coldwell, Indianapolis, Ind.
R. F. Conway Co., Chicago, Ill.
Thos. L. Dooley, Chicago, Ill.
Joseph J. Duffy & Co., Chicago, Ill.
Fielding & Shepley, St. Paul, Minn.
J. U. Fritchey, Lancaster, Pa.
Gilsonite Construction Co., St. Louis, Mo.
J. H. Green & Son, Appleton, Wis.
Hoosier Construction Co., Indianapolis, Ind.
Wm. Krause & Son, Philadelphia, Pa.
F. H. Kirchner & Co., Cincinnati, O.
Lake Erie Asphalt Block Co., Toledo, O.
J. H. Marden Cement Paving Co., La Crosse, Wis
John A. McGarry & Co., Chicago, Ill.
Nashville Roofing & Paving Co., Nashville, Tenn.
Nelson Paving Co., Waco, Tex.
A. G. Pugh, Columbus, O.
Republic Chemical & Creosoting Co., Indianapolis, Ind.
M. C. Russell Cement Paving Co., Springfield, O.
Schillinger Bros. Co., Toledo, O.
W. H. Settle & Co., Cincinnati, O.
Smith, Moss & Brown, Chicago, Ill.
Standard Paving Co., Newark, N. J.
Troy Public Works Co., Utica, N. Y.
Western Construction Co., Lafayette, Ind.
Warren Asphalt Paving Co., Utica, N. Y.
Warren Bros. Co., Boston, Mass.

Paving Pitch.
Ellis-Blum Co., Meadville, Pa.
E. B. Warren & Co., Washington, D. C.

Paving Tools.
W. H. Anderson & Sons, Detroit, Mich.
Contractors' Tool Company, Philadelphia, Pa.
F. H. Crafts, Rochester, N. Y.
Iroquois Iron Works, Buffalo, N. Y.
Orr & Lockett Hardware Co., Chicago, Ill.
Julian Scholl & Co., New York City.

THE UNITED STATES SAND FILTRATION COMPANY

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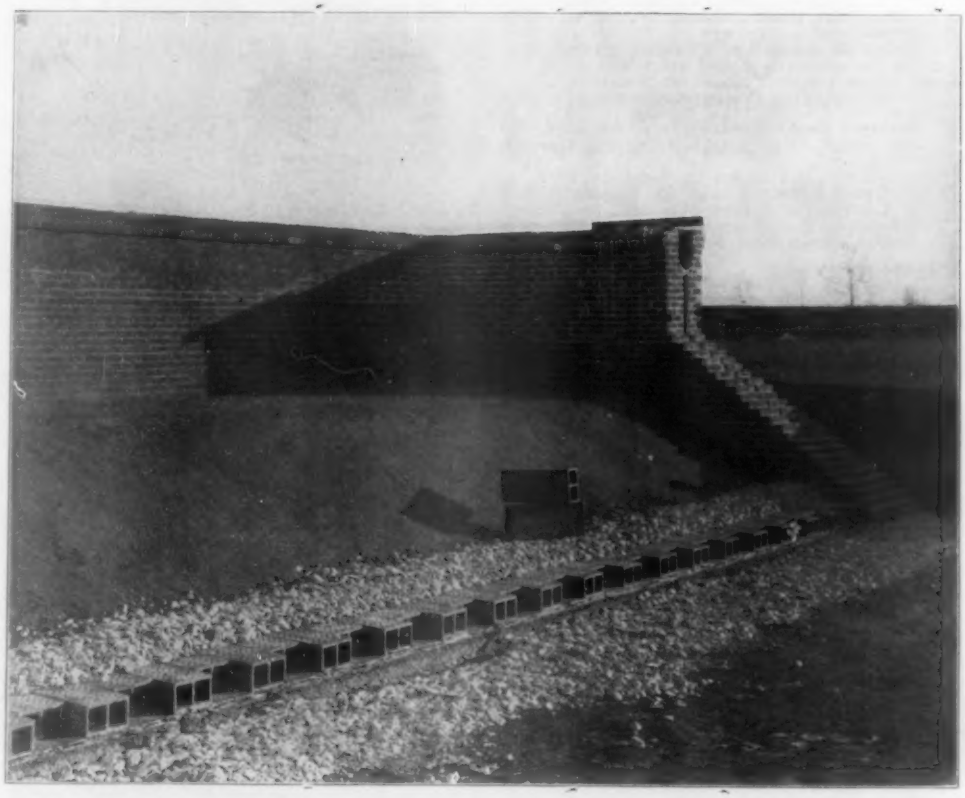

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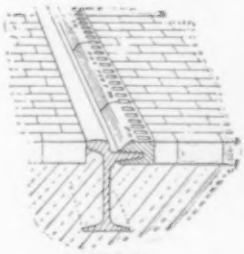

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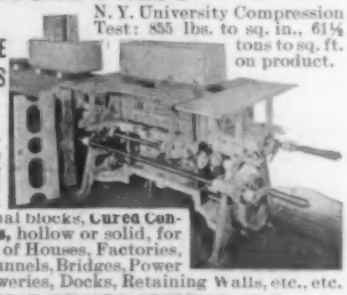

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Steel-Bound Concrete Curb

AND

COMBINED STEEL-BOUND CURB AND GUTTER.

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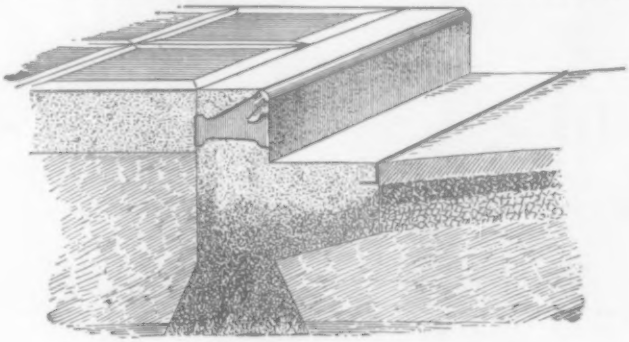
ABSOLUTELY NON-BREAKABLE. **CHEAPER THAN GRANITE.**



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Handsomer than Granite and Much Stronger.

Continuous in Construction, hence Never out of Line.

GALVANIZED STEEL CORNER BAR Prevents Chipping or Breaking on Edges. **Cannot be Displaced by Frost.**

Never Requires Re-setting or Repairs.

It is the Most Beautiful and Durable Curb Laid, and with Gutter Combined

It is the Ideal for Asphalt, Brick or Macadam Roadways.

Wherever presented, this Curb has met with universal approval of City Engineers, Property owners and others connected with Municipal Improvements. It has been thoroughly tested, and is in use in over TWENTY-FIVE cities in the Eastern and Middle States, and under recently made contracts its use will be extended to many more this year.

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The cut on opposite page illustrates the general appearance and advantages of the **Wainwright Steel-Bound Concrete Curb,** as constructed in accordance **with the printed directions and the Patents of this Company.**

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Ordinary Cement Curbing, and the cheaper grades of stone used, require constant renewing and repairs. Stone curbs, from various causes, shift their positions and become "out of line." The alignment of the **Wainwright Steel-Bound Curb** is perfect, and it **Will Stay Exactly as Placed.**

This Curb is Mechanically Perfect, and Unequalled for Curved Corners.

The cut shows an ideal plan for sidewalks, curb, gutter and street pavements, but particular attention is called to the curb, with its edge protected by a galvanized curved bar, with a dovetailed web or tongue extending into the concrete, giving **Perfect Protection.** The galvanized surface conforms in color to the concrete, giving a harmonious effect, free from stain or discoloration.

Investigation is solicited from property owners, builders and corporations, especially **Railroad Companies** desiring to strengthen their platforms and beautify their Station surroundings.

City Engineers, to whose notice this Curb has not yet been brought, can safely recommend it as a permanent improvement, not only on account of its general merits, but because of its reasonable price.

The price of this Curb, finished and in place, varies according to conditions, and when laid, **Requires No Resetting or Repairs,** while the results attained are greatly superior to those of any Curbing ever laid. Years of severe testing and practical use, to extent of hundreds of thousands of feet, without an instance of failure, have fully demonstrated the fact that the **Wainwright Steel-Bound Concrete Curb** is not only of practical use, but a pronounced financial success.

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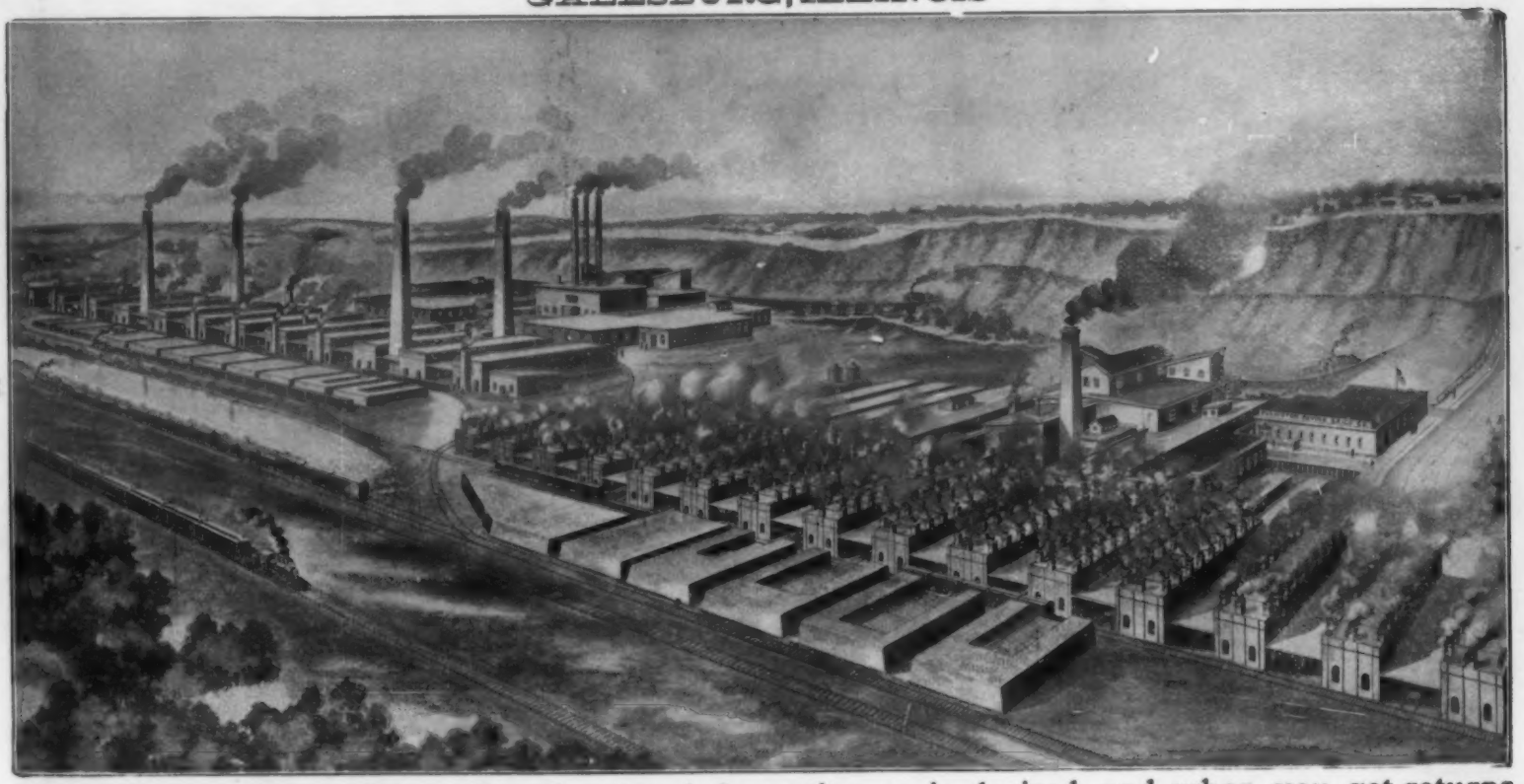

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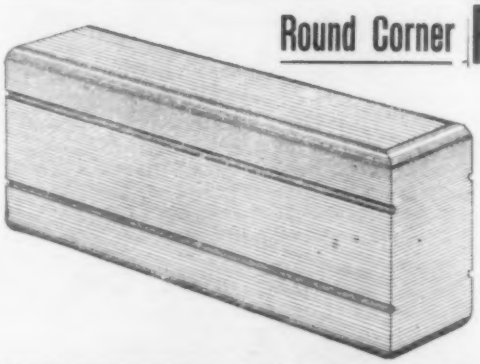

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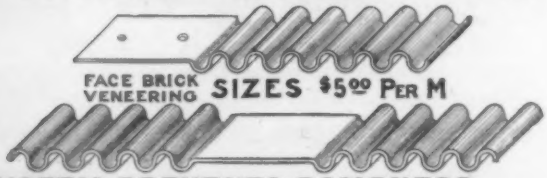

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TWO LETTERS AND THE STORY THEY TELL

LETTER No. 1

803-7 Drexel Building, Philadelphia, Pa.
October 31, 1902.

MUNICIPAL ENGINEERING COMPANY:

Gentlemen—I take pleasure in enclosing you a copy of communication just received by me from Shanghai, China.

From the fact that I have in the past received inquiries from Hawaii, Mexico and Cuba, it would seem that your valuable magazine covers a large territory, and I feel it only due you that you should be in possession of these facts. Very truly yours.

W. W. BENSON, per T.

LETTER No. 2

Shanghai Municipal Council,
Engineer's Office, Hankow Road, Shanghai, China.
September 8, 1902.

Dear Sir: Referring to your advertisement in Municipal Engineering, I should feel obliged if you would send me the latest edition of your . . . . Cement Construction . . . . . catalogue (with prices), in stiff covers if possible, also new editions as they are issued.

Wrappers should be clearly marked "C. L."

Yours faithfully (Signed), CHARLES MAYNE,
Municipal Engineer.

Catalogue Library. [COPY]

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WATER METERS.

Sealed proposals will be received at the office of the Clerk of the Board of Control, No. 105 City Hall, until 12 o'clock M., December 27, 1902, for furnishing and delivering f. o. b. cars in the City of Cleveland, fifteen thousand (15,000) ⅝-inch water meters, for the Water-Works Division of the Department of Public Works of the City of Cleveland, Ohio.

Plans and specifications may be seen and blank proposals can be obtained at the office of the Superintendent of Water-Works.

Each proposal must contain the full name of the party or parties making the same, and all persons interested therein, and must be accompanied by a certified check for five thousand ($5,000) dollars, payable to the Director of Public Works, on a solvent bank in the city, as surety that if the proposal be accepted a contract will be entered into.

No proposal will be entertained unless made on the blanks furnished by the Superintendent of Water-Works and delivered at the office of the Clerk of the Board of Control, No. 105 City Hall, previous to 12 o'clock M. on the day specified.

The city reserves the right to reject any or all bids.

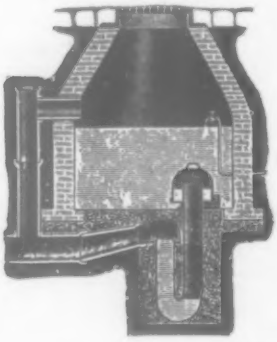
CHARLES P. SALEN,
Director of Public Works.

Cleveland, Ohio, November 28, 1902.

NOTICE.

Notice is hereby given that the Board of County Commissioners of Newton county, Indiana, at a special session of said Board to be held at the Auditor's office in the Court House in the town of Kentland, on December 9, 1902, will, up to 12 o'clock noon of said day, receive sealed bids for furnishing material and constructing free macadam roads in Colfax township, Newton county, Indiana, according to the plans, specifications and kind of material as shown in the report of the viewers appointed by this Board to view and report on the petition praying for the location and construction of said roads, which report is now on file in the office of the Auditor of said county. All bidders are required to furnish a good and sufficient bond payable to the State of Indiana, in twice the sum of their bids. Said Board reserves the right to reject any or all bids.

EDWARD E. PARSONS,
JOHN KENNEDY,
GEORGE F. MERCHANT,
Board of Commissioners of Newton County,
Attest: SCHUYLER C. JONES,
Auditor of Newton County.



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NOTICE FOR BIDS FOR CONSTRUCTION OF RENTON WATER-WORKS.

Notice is hereby given that bids will be received for the construction of a system of water-works in the town of Renton, at the office of the Town Clerk of Renton, up to and including ten (10) o'clock, on the eighth (8th) day of December, 1902.

Specifications and plans for said water-works may be seen at the office of Blake & Williams, 433 Burke building, Seattle, Wash.

All bids must be accompanied by a certified check to the amount of five (5) per cent. of the bid, made payable to the order of the town of Renton.

GEORGE W. CUSTER,
Clerk of the Town of Renton.

NOTICE

Of letting construction of macadamized roads in Center and Coolspring townships, Laporte county, Indiana.

Notice is hereby given that, on Thursday, December 11, 1902, at 11 o'clock A. M., at the Auditor's office in the city of Laporte, Ind., the Board to Commissioners of Laporte county will receive bids for the construction of a series of macadamized roads in Center and Coolspring townships, in said county, about six and four-tenths (6 4-10) miles in length, according to the viewers' report now on file in said Auditor's office.

Sealed bids may be left with the undersigned Auditor up to 11 o'clock A. M. of above-mentioned day of December 11, 1902.

Bond for double the amount of the bid must accompany all bids, and also $1,000 in cash must be paid into the county treasury by each bidder when filing his bid as security that contract will be entered into, same to be returned to unsuccessful bidders.

The Board reserves the right to reject any and all bids.

JOHN R. WEAVER,
WILLIAM STEIGELY,
JAMES TAYLOR,
Commissioners of Laporte County.

Attest: FRANCIS H. DORAN, Auditor Laporte county.

November 14, 1902.

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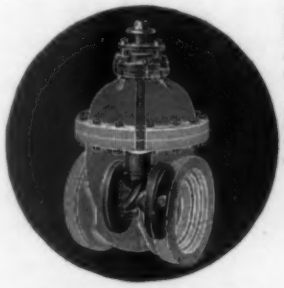

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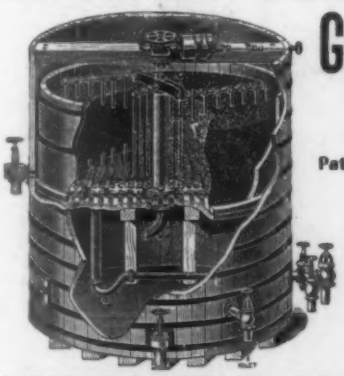

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Engineer, Board of Sny Island Levee Drainage, Pittsfield, Ill.

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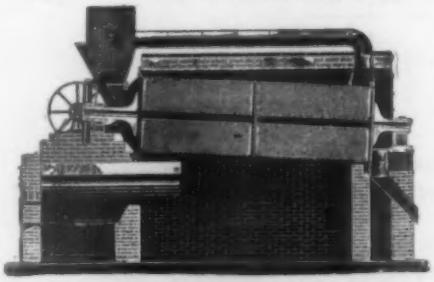

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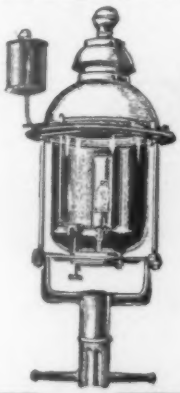

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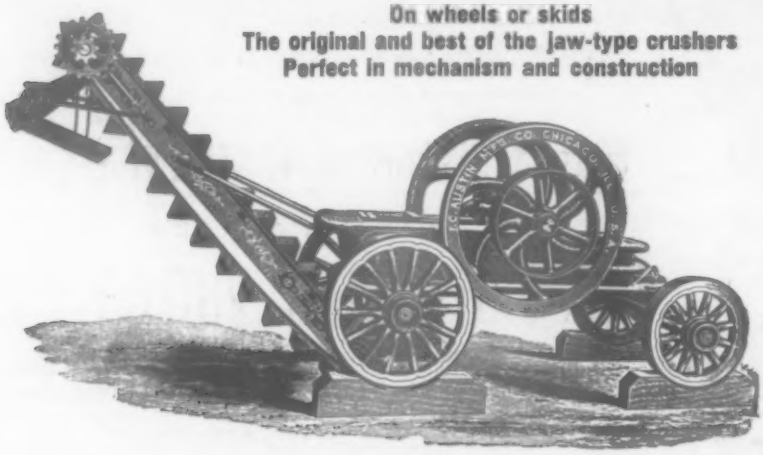

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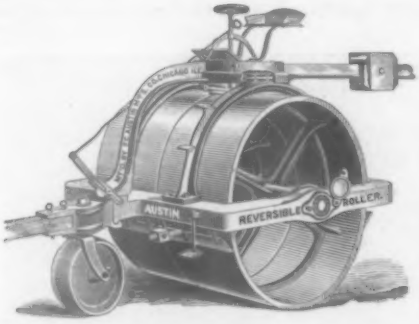

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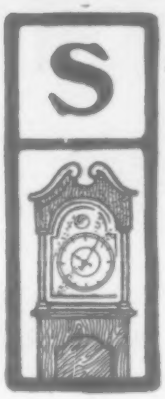

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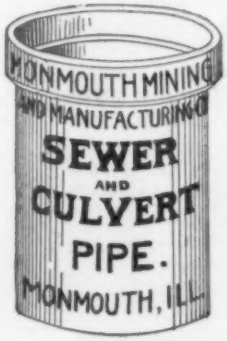

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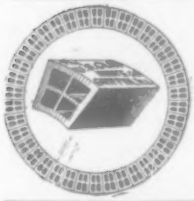

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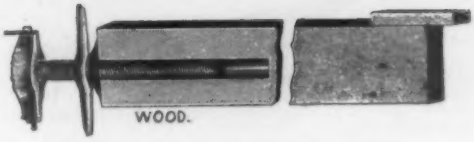

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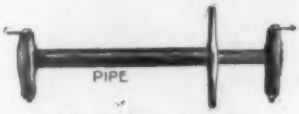

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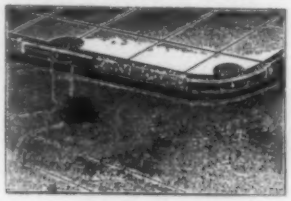

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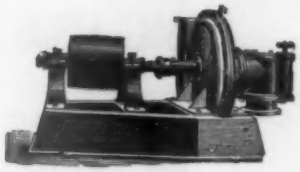

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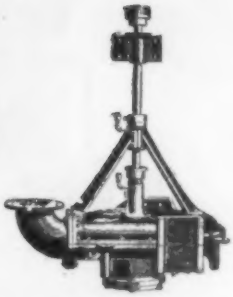

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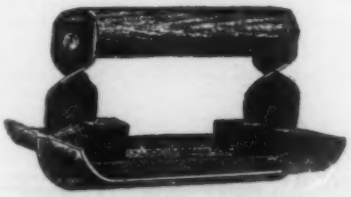

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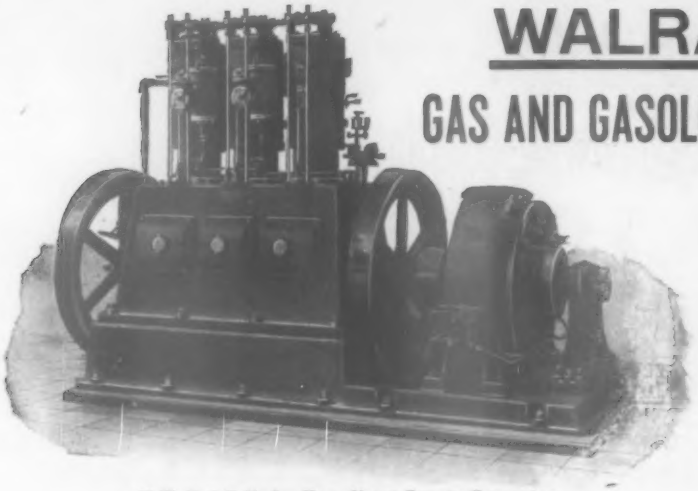

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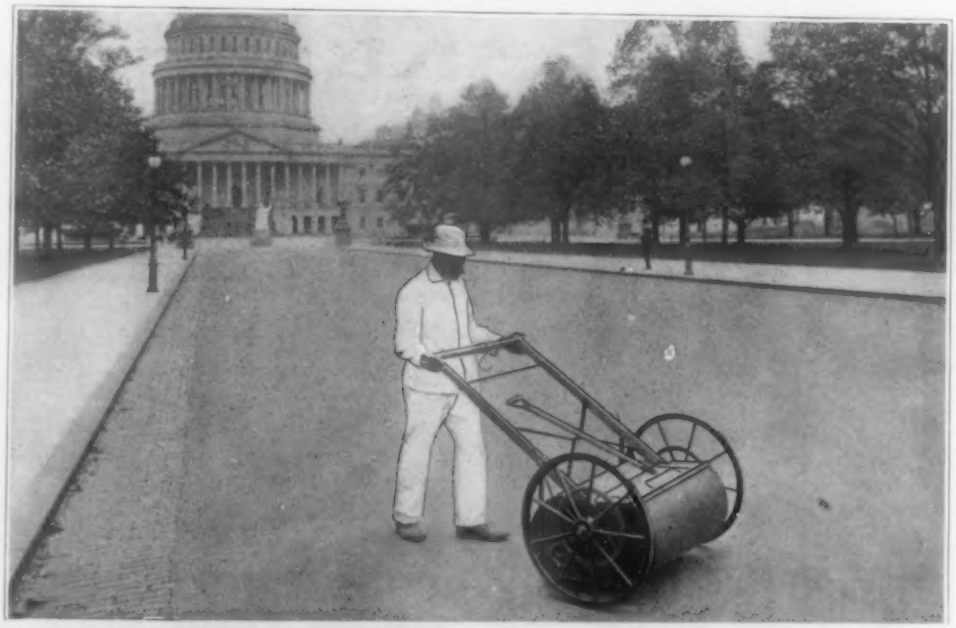

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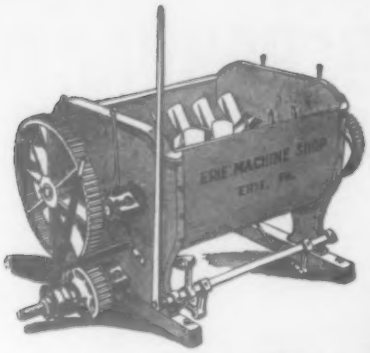

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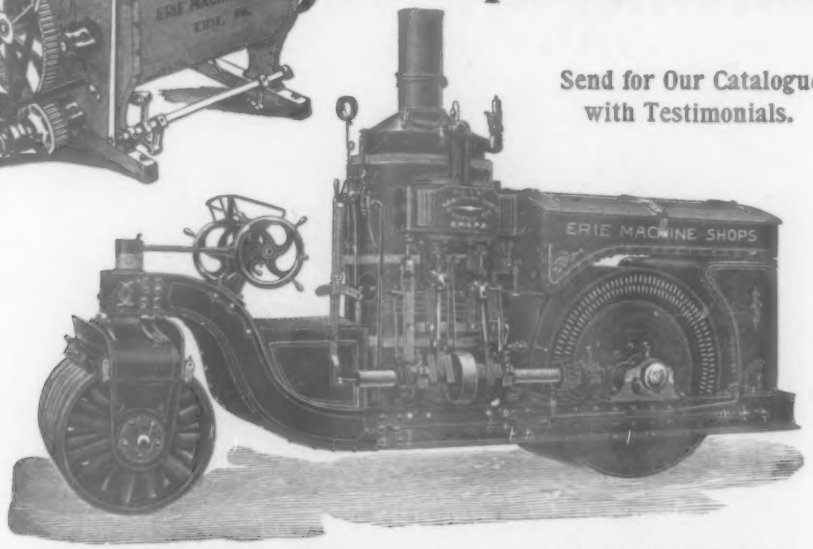

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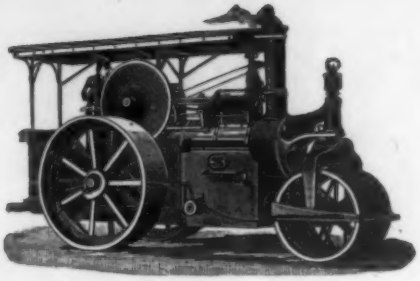

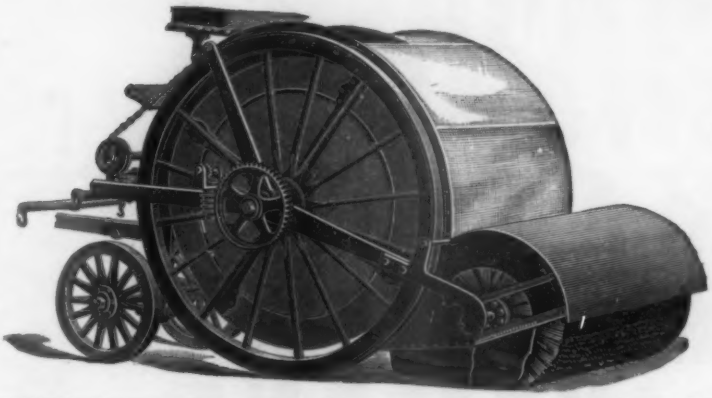

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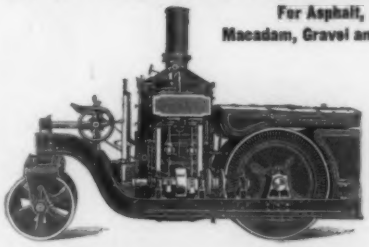

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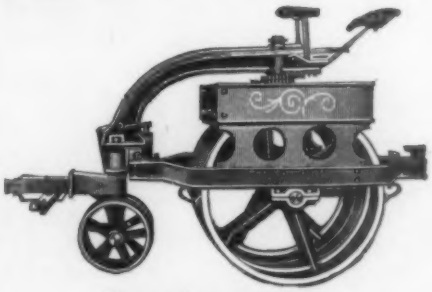

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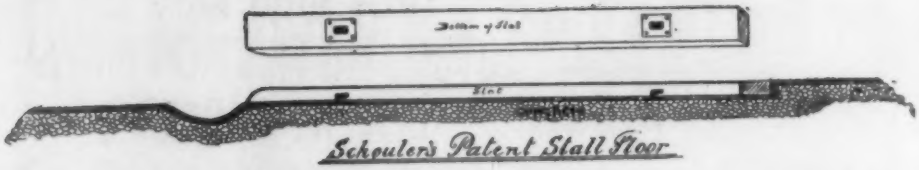

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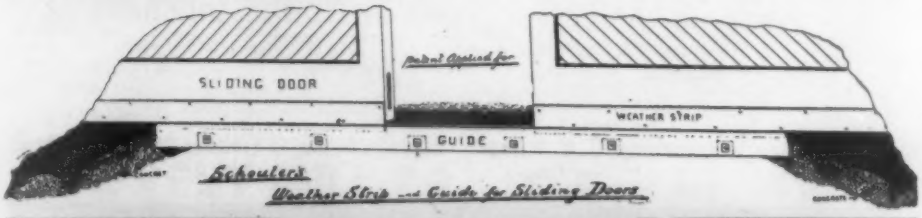

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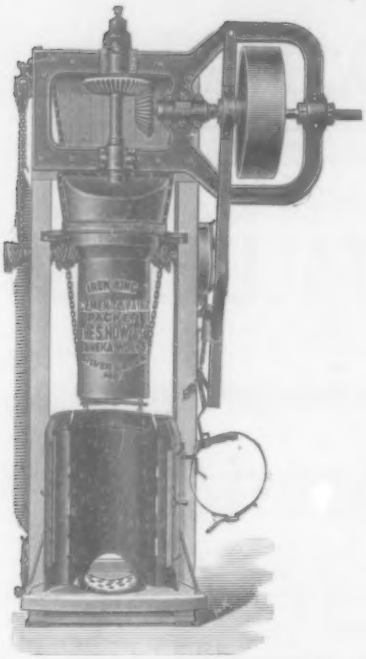

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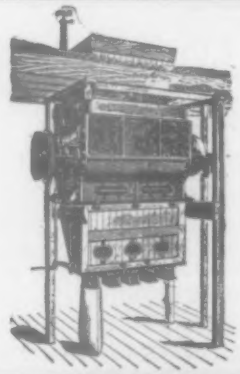

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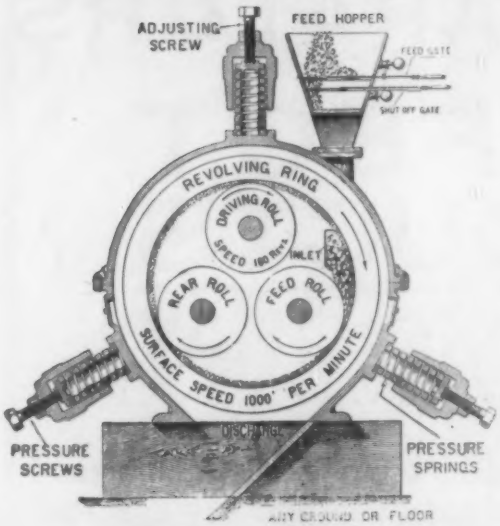

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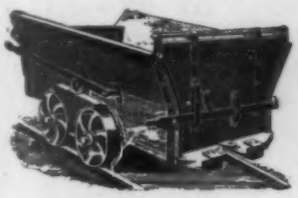

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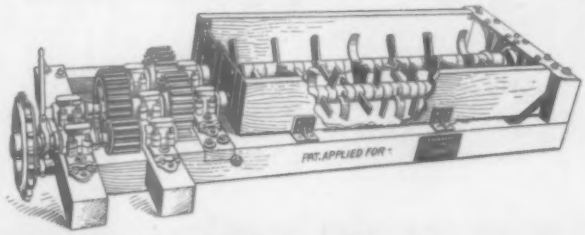

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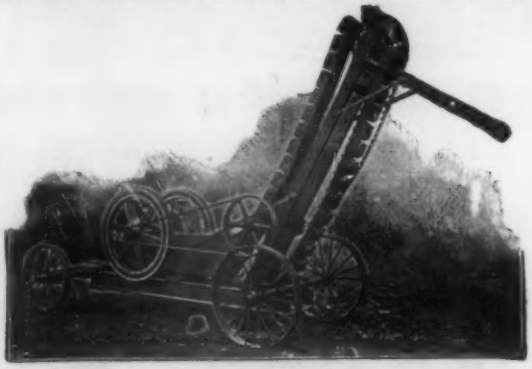

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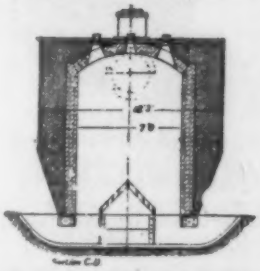

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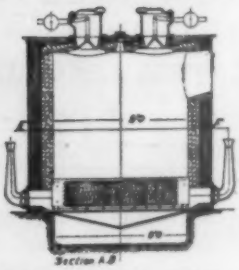

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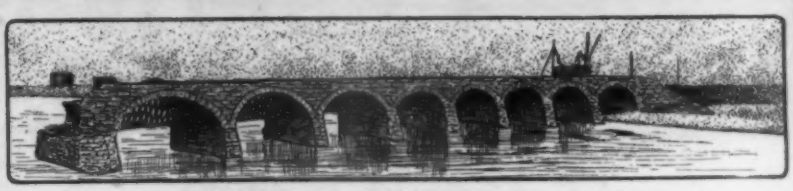

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